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The Farmer's Digest

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Volume 8 March, 1945 Number 10

Your Land Belongs to Tomorrow

Condensed from The Hereford Journal

Ladd Haystead

New York, N. Y.

City folks are inclined to think that the topic of land-use policy for farm property is strictly somebody else's business. Then one day mills and factories close down for lack of water power. The mayor asks everyone to use less water in the home and on the lawns for he fears there will not be sufficient pressure in the mains if a great fire comes along.

And, about that time — but only recently—a strange missionary rises up and speaks in press and from the platform to tell the city people that country land, its use and abuse, is very much their business for if the land is handled improperly, water supplies disappear and cities get very sick and are threatened with grave economic and health troubles.

Too often, livestockmen take an attitude similar to city men. They say this conservation stuff is all right for sod-busters, or for farmers in flood areas, but it's nothing for a stockman to worry about unless he is also row-cropping heavily. And, even then, there is more of a tendency to "sluff" off attention in favor of the consideration of what Washington will do next and how strong is the livestock market. But in actuality, livestockmen have perhaps the greatest stake of all in conservation for "all flesh is grass," and grass is the very root and heart of the conservation program.

The rangeman often says that there is nothing for him to worry about except a good rain. Perhaps he has over-grazed a little here and there. Maybe, if things are pretty dry, he ought to lighten up a little and add a few acres more per head to his program. Anyway, next year the grass is going to be better than ever. It's

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always "going to be better" next year.

Sure, he notices that where water hole trails run up and down the slope they tend to gully out when a flash rain comes. And, maybe, the carrying power of his land isn't as high as it was in the good old days. Yet, with the OPA mess in Washington to worry a fellow, how can you expect him to pay much attention to the condition of his soil?

But, already in these United States we have lost forever 50,000,000 acres of land. It's gone down the streams to the rivers and down the rivers to the sea. And it's never coming back. Another 50,000,000 is badly eroded, well on its way to follow the first 50,000,000. Still another 200,000,000 is under serious threat and if not put under a sound conservation policy will join the wasteland. And only too much of the land that has gone and the land that is going is owned or used by stockmen.

There is still another place and a mighty important one in which stockmen should have a very special interest in conservation. That is in the other fellow's land. The latter's interest in conservation suggests very persuasive reasons why conservation literally makes new customers for all livestock and especially beef cattle. The steps are these:

As practically everyone in agriculture knows, a conservation program starts with an awareness of groups of land users that their precious topsoil is being carried away by wind or water erosion. They decide to do something about it. Surveys and land-use diagrams follow. Then comes terracing, strip-cropping, contouring and the planting of land to various grasses, annual or perennial cover. Too often, the new conservationists think the job is done when they have got that far. It isn't. The most practical way to turn cover into cash is to utilize it through livestock. To some, livestock has an even more important role—that of getting manure on the land.

In the South, for example, farmers have been forced out of cotton and tobacco and into kudzu, lespedeza and crimson clover. To make a good stand and keep the weeds down these pastures must be mowed. The greatest mowing machine in the world is a cow's teeth.

Next, if the cover is to improve in yield and vigor it must be fertilized. Lime and phosphate are cardinal points in the program. But neither lime nor phosphate puts bacteria into the soil. Neither, alone or in combination, makes a complete fertilizer. With manure, though, as part of the program, the pastures increase in yield and carrying power from

year to year. And that is just one of the important reasons in addition to turning cover into cash why the South in recent years has become one of the greatest new markets for beef cattle. The South is now considered one of the prime Hereford sections of the country. Yet only a few years ago, you could ride for days through that section and see little but cotton. Any four-legged animal except the mule was practically a curiosity.

It is, therefore, good business to keep an eye on any announcements of new conservation districts under construction. Where the conservation program is put into effect this year there will be a new or larger market for beef cattle next year and the years after.

In some sections of the northeast the highest rate of land abandonment in the country is prevalent. Tens of thousands of acres of once fairly good farm land now are lying idle. The owners thought that the fertility was gone for good. They had "mined out" the old home place and usually moved on west, unfortunately, to repeat their sins again. The folks left behind agreed with the judgment that the lands were gone for good, that there was nothing to do but let scrub browse and whatever poor grasses that might grow take over the land. At the same time, the state or township often found itself falling heir to these lands via the tax route.

In recent years, though, a growing number of "crazy people" have been buying up these lands. Often they were city folk. The countryside chuckled at the way the city slickers were taken in. In most cases, the city folks literally "had" been taken in. In other cases they knew exactly what they were doing. Some of the first stayed with their buys, however, and joined the ranks of the second. They put the worn-out soil into grass and began the grassland farming program which is quickly becoming the most important new thing in Northeastern agriculture. And again, after using mineral fertilizer to get the grass started the next step was to put cattle on the place.

An alert cattle breed association got in step with this grassland program at once. Lately their sales have increased in number and price at a good rate. They not only talk their breed, but they are great salesmen for the clovers, rye and orchard grass, birdsfoot trefoil, brome grass and a dozen other strains which people rarely talked about a few years ago. Row crops get little part of their attention. They are interested, in effect, in building a new domestic range—a planted range—in the East. And every farmer they can convert to

a grassland program, every city man that they can sell on grass become new customers for their cattle. Hence, conservation doesn't necessarily mean cutting down potential income as so many skeptics think. It can be the smartest kind of a business move which not only conserves but enhances both capital and income.

For years, some of us vastly interested in this conservation business have more or less "driven the hearse" to get our story across. We have pointed out the brutal history of American land-abuse. We have called attention to the economic death which follows non-conservation practices. We have tried to scare converts into our fold by presenting a picture of a dire Hades-on-earth if folks didn't get religion and join our band. "Fear selling" sometimes is the only selling that will succeed. And, in fact, many of us thought that land users "would" have to give up hoped for income in order to protect their soil. It was either get less money now or get no money at all tomorrow.

But times and our story have changed. Now we know that in many cases land users under conservation can confidently expect greater returns than ever before. We have plenty of stories of actual cases in the South where the operator was making a quarter-bale to the acre, 10 to 12 bushels of corn, or a piddling little amount in oats that hardly paid for the effort to sow the crop.

Under a conservation program on that same almost worn-out land, cotton in rotation is up as high as 300 percent over the yield expected when the new ideas were put into effect. In some sections on only a fraction of the previous cotton average the total yield of the area is double or triple what it has been. Corn has gone up, under like circumstances, to 30 and 35 bushels. That is not the sort of yield Iowa expects, but then this climate and soil were never intended to be prime corn land. Oat yields have skyrocketed. Where no hay nor anything else would grow at one time, kudzu, high in carotene, protein and minerals, now makes two tons to the acre. Conservation doesn't necessarily "cost"; conservation can "pay" in cash.

Near Guthrie, in Oklahoma, the soil conservation service has taken abandoned, gullied, practically worthless land which had got so bad that it was hard to figure cotton yields of over a hundred pounds of lint. With brush dams, grasses seeded down and a bit of fertilizing, that land which wouldn't carry a jaybird a few years ago now makes as much as 50 pounds of beef per acre.

If permitted, the writer would like to get in a plug for one of the most worthwhile, non-profit, non-political, non-sectarian organizations in the country. No one makes any money out of it. Nobody gets any fame out of it. The only reward the members receive for their expenditure of money, time and effort is the patriotic satisfaction of contributing something to the whole nation and its future. The members are farmers, ranchmen, doctors, lawyers, business men, city guys, garden clubs, bankers and, oddly enough, so-called big industrialists. Their program is simple. They want to conserve for the future of all the people, the soil, water, and human resources of this country. They are called "Friends of the Land" and they deserve the best wishes of every person in the livestock industry for a major point in their program is—more livestock.

They believe that land should not be the sole property of an individual to do with as he pleases. (No, they aren't Communists.) But, after looking back over the tragic land history of our country where some farmers have boasted, "I've worn out two farms and I'll wear this one out before I die," they think that the land-user should be a trustee rather than a dictator. They believe his land is part of the national heritage. He can be as selfish as he wants and they will agree, just so that selfishness takes the form of a mighty resolve that his kids will get a better farm or ranch from him than he got when he came on the place. Down in Oklahoma where this group in conjunction with civic organizations and the state planning board recently held a highly successful soil clinic, a phrase was thought up as a slogan which should be not just Oklahoman but national. It was: "Conserve your soil or sell your land."

Your soil is not only today's livelihood. Its use determines whether your children, America's children, will have a rich or a poor future. In short, your land belongs to tomorrow.

Cornstalks to the Rescue

Condensed from New Jersey Agriculture

Firman E. Bear

Head, Soils Department

Now that the tractor has taken over the horse's job on many vegetable farms, little livestock remains to produce the manure that has long been considered so essential to high acre yields of cabbages, beans, carrots and the other stock in trade of the green grocer.

Furthermore, the supplies of shipped-in horse manure from city stables does not begin to meet the needs for such materials on the vegetable soils of New Jersey. Accordingly, efforts have been made to find substitutes, and it seems that the cornfield may rival the stable in the production of high quality organic matter.

In an effort to find a synthetic manure, the soils department at the New Jersey Agricultural College Experiment Station is experimenting with 35 organic matter systems. Included in the materials being tested for manure-making purposes, both in compost piles, and in the soil itself, are rye, ryegrass, vetch, wheat straw, pine and oak shavings, peat, salt hay and cornstalks. Of all these crops and crop wastes, cornstalks seem to be the best.

When shredded cornstalks are built up into a compost pile, to the successive layers of which a mixture of 2 parts each of sulfate of ammonia and limestone and 1 part of superphosphate are applied at the rate of 150 pounds per ton, and kept moist, rapid rotting results with the production of an excellent quality of synthetic manure.

The quality of the manure that can readily be made in this manner is excellent. But is it necessary to build a compost pile to produce that type of manure? Why not plow the cornstalks, fertilizer, and lime under and let them rot in the soil?

Experiments along this line have shown that plowed-under cornstalks rot rapidly to make the same excellent quality of manure that is produced in the compost pile. As this is worked out in the field, all that is necessary is to apply the usual quantity of about a ton of lime and 500 pounds of superphosphate per acre, and in addition broad-

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cast about 100 pounds of sulfate of ammonia over each ton of stalks, turning the whole quantity of materials under and letting Nature do her work.

As an average of a 4-year test, Sassafras loam soil on which cornstalks have been so used has produced higher yields of snap-beans and carrots than by the use of any other type of organic matter. Much better crops were produced by the use of cornstalk manure than from fresh cow manure.

One may well raise a question as to where the necessary cornstalks are to come from in the vegetable-growing areas of the state. One important source is sweet corn which, in many areas, can be introduced into the rotation with profit. Then there is the possibility of sowing corn broadcast as a summer cover crop for plowing-under purposes. If this does not seem feasible, such winter cover crops as rye and ryegrass and such summer crops as Sudan grass are available for use.

The essential point is to use plenty of lime and superphosphate and add extra nitrogen, the equivalent of 100 pounds of sulfate of ammonia per ton of material, to these cover crops before plowing them under. Then give them a few weeks' time to rot before the next crop is planted.

When a Cow Has Milk Fever

Thanks to modern veterinary science most cows can now be brought safely through an attack of milk fever, but unless proper precautions are taken one may lose the animal a few days later with mechanical pneumonia.

When a cow is stretched out, completely paralyzed with milk fever, the valve between the stomach and gullet also becomes paralyzed and allows the fluid contents of the stomach to run down into the throat, and the cow inhales a large portion of this fluid into her lungs when she breathes.

The danger of mechanical pneumonia may be avoided by elevating the head of the animal. This can very easily be done by placing a bag of hay under the head of the cow in order to prevent her from inhaling any material flowing from the stomach.

—Alvah Bartlett

Ladino Clover

Condensed from American Agriculturist

George H. Serviss

THE BEST salesman for Ladino clover is not the man who sells the seed, but the man who grows it. The acreage of this legume, which for years went practically unnoticed in the Northeast, is increasing as rapidly as the seed supply will permit. At present it does not seem unreasonable to predict its eventual use in half of the hay seedings made in the Northeast and most of the pasture seedings. This still leaves plenty of room for other legumes, for Ladino will frequently be seeded in combination with others and there are unquestionably some soil and climatic conditions that are not so favorable for it as for some others.

Ladino's popularity is due to a number of factors. It is perennial for one thing and will thrive in many situations where alfalfa will not. That means better hay and larger yields from two, three and four year old meadows that otherwise would be producing rather low yields of straight timothy hay.

Ladino recovers quickly after cutting and is very palatable to all kinds of livestock. It is almost an ideal plant to include in meadow mixtures to provide the aftermath grazing so badly needed on most dairy farms. Another point in its favor is that it is quick to establish itself and new seedings of it made in the spring usually furnish considerable grazing in the late summer and early fall.

The perfect forage plant has not yet been found and probably never will be. Ladino clover with all of its good points has some weaknesses. It sometimes winterkills, it is difficult to mow and hard to cure, it requires a rather high fertility level to be really productive, and under some systems of management does not stand the competition of other plants well. These weaknesses, though, have not prevented a rapid expansion in acreage. Reasonably good management and fertilization will guard against them to a considerable extent.

Ladino clover will do well over quite a range of soil conditions. It is most productive on fertile soils of good moisture-holding capacity. Soils that are a little wet and heavy for alfalfa to winter well seem to be ideal for it. Strictly from the hay standpoint, it does not appear advisable to

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seed it on good alfalfa land either alone or in mixture with alfalfa, as alfalfa will outyield it under those conditions. This does not appear to be true though where a field is to be used for both hay and pasture. Its use should generally be avoided on very droughty and very wet soils.

No forage plant that is worth growing has yet been found that will produce high yields of nutritious forage on exhausted soils. Farmers have recognized the fact for years that alfalfa will not; neither will Ladino. The soil should contain a fair amount of lime; that is, the pH should be around 6 or higher for best results. Three to five hundred pounds to the acre of superphosphate or a mixed fertilizer such as an 0-20-20 should be applied prior to seeding. Whether superphosphate or a mixed fertilizer should be used depends on the amount of manure that was applied the year prior to seeding and the kind of soil.

Numerous seeding recommendations involving Ladino clover can be found. On the surface they seem to differ widely but actually are in fair agreement on basic principles.

One pound of Ladino seed to the acre is generally recommended when it is seeded in a mixture containing other legumes, such as red clover, alfalfa and alsike clover. Two pounds of Ladino seed to the acre is usually suggested where no other legume is included in the mixture. Actually one pound is enough, even where it is the only legume, when it is evenly distributed on a good seedbed. Except for special conditions, such as poultry pastures, one or more tall growing hay type grasses should be seeded with it. Timothy is the most popular, but orchard grass, smooth brome grass and tall fescue are also used to a greater or less extent. For most situations, there seems to be little or nothing to be gained by adding alsike clover to a mixture containing Ladino.

Most of the Ladino seeded this year will probably be used in seedings that are to be left down from two to four years and utilized for hay and aftermath pasture. For this type of mixture a good rule to follow is to substitute one pound of Ladino clover seed for the alsike in the mixture. For example, where a mixture of 6 pounds of medium red clover, 4 pounds of alsike clover, and 6 to 8 pounds of timothy has been used, the mixture would become 6 pounds of medium red clover, 1 pound of Ladino clover and 6 to 8 pounds of timothy. This type of mixture is well suited to much of the land in New York State that is not well suited to alfalfa.

Red clover, alfalfa, Ladino and timothy make an excellent type

of mixture for land on which alfalfa will stick fairly well and aftermath pasture is desired. This can be made up of 3 to 4 pounds of red clover, 5 to 6 pounds of alfalfa, 1 pound of Ladino and 6 to 8 pounds of timothy.

The addition of a pound of Ladino to an alfalfa-orchard, alfalfa-brome grass or alfalfa-orchard grass mixture seems to be advisable if the crop is to be used for pasture as well as for hay, or if there are quite a few damp areas in the field where alfalfa will not hold over winter.

A mixture of two pounds of Ladino and 7 pounds of timothy seed is very popular in some parts of the Northeast. This is usually used on soils that are not well adapted to alfalfa, that are liberally fertilized, and where the hay land must be pastured rather heavily as well as used for hay production.

Getting a seeding of Ladino has not been very much of a problem. The difficulty with the crop has been in maintaining it. On some farms it will persist and be productive for 7 or 8 years, on others it will go out after one year. With favorable soil and climatic conditions and good management it should last for 3 to 5 years. The following factors appear to be quite important in maintaining Ladino:

1. Ladino is a high fertility crop and on most soils needs more than a small application of fertilizer at seeding time to keep it productive. A light top-dressing of superphosphated manure on the new seeding in the fall or winter is very desirable. This should be repeated every other year. On some soils top-dressing with superphosphate is a fair substitute for superphosphated manure, but on many soils an 0-20-20 or 0-14-14 should be used if manure is not available.

2. While Ladino is a perennial, it often winterkills in spots and sometimes over the entire field. Allowance for some reseeding in the first year is therefore desirable. A seed crop will make in 7 to 8 weeks after the first cutting. Therefore, it is desirable to wait 7 or 8 weeks before mowing the second growth or pasturing heavily in the first crop year.

3. Pasturing lightly in the fall of the seeding year appears to be beneficial to Ladino. Heavy pasturing, though, may be injurious to any alfalfa or red clover in the mixture.

4. A heavy growth of alfalfa, red clover or grass growing in association with Ladino will crowd it and thin the stand of Ladino. Therefore, it is generally advisable to mow Ladino mixtures before other mixtures so as to remove this competition as soon as possible.

This year, there is considerably

more seed available than last year. Since some other seeds, especially alfalfa, are short of the demand, this is very fortunate. While Ladino seed is high on a pound basis, it is not out of line with other legume seeds on an acre basis. All of the available seed should be used, for the crop is well worth the cost.

Pastures and Roughage

Condensed from Guernsey Breeders' Journal

Dr. H. A. Herman
University of Missouri

BOTH the quantity and the nutritive quality of the milk may be influenced by the amount and character of the feed a cow received. Every experienced dairyman has observed the effect of feed quantity and quality on the milk flow, but it must be further appreciated that the character of the diet is also markedly reflected in the vitamin content and the composition of the fat in the milk. Contrary to popular opinion, the amount of protein, sugar, mineral, etc., in milk is little affected by the cow's ration. The vitamin content of milk may vary greatly, depending upon conditions of feeding and management. Under experimental conditions the amount of vitamins A and D, for example in milk, may be made very low or pushed above normal levels. Since there are no quick and easy tests such as the Babcock test for determining the vitamin content of milk, we are less aware of these changes. The milk from well-managed and properly fed herds is generally higher in vitamin content than that of cows forced to eat only poor quality roughages, etc. Cows fed plenty of good quality silage, green leafy hay and provided with plenty of luxuriant pasture produce milk of maximum vitamin content. The vitamin content of fruits, vegetables and foodstuffs in general varies, and dairy products are not unique in this respect. The dairy industry, however, particularly with respect to butter, is often singled out and unfairly attacked by the milk and butter substitute manufacturers on this particular point. We will briefly summarize the effect of feed on milk composition, then consider the factors affecting the nutritive value of roughages.

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I.

Effect Of The Ration On The Composition Of Milk

Fat. Generally, the ration composed of normal feedstuffs does not affect the per cent of fat in milk. Short-time experiments have indicated that crushed soybeans and various vegetable oils give a slight increase, but the effect over an entire lactation of low vs. high fat intake shows little difference in the percent of milk fat. Cows have demonstrated their ability to produce milk of normal fat content from rations containing a low percentage of fat. (It is well established that carbohydrates may be converted into fat by the body processes).

The character of the feed fat does markedly affect the milk fat in composition. For instance, cottonseed meal produces a hard butter. Linseed meal, with its high linoleic acid content, produces soft fat. Pasture grasses, as the result of fatty acids such as oleic generally produce soft butter.

Protein. Diet has little or no effect.

Sugar. Diet has little or no effect.

Minerals. Again contrary to popular opinion, the mineral content of the ration has little or no effect on the mineral content of the milk. In rare cases, as under medicinal treatment, iodine, arsenic, boric acid, bromine and lead may pass into the milk and result in toxicity to humans.

Vitamins. Most markedly affected by the ration: B and C (and flavin of the B complex) are synthesized by the rumen and are always present in normal milk.

Vitamins A, D and E are not synthesized by the bovine and their presence in milk depends upon intake of feed (and exposure to sunlight in the case of vitamin D).

Vitamin E we know little about. Cattle apparently do not require it, but if so get plenty from feed.

II.

Factors Determining Nutritive Value Of Roughages

Quality in roughage generally means "feed value." High quality roughages are those possessing the physical and chemical characteristics commonly associated with palatability and an abundance of feed nutrients.

The most important physical factors of quality that may be gauged in a practical way by a dairyman in selective roughages are: (1) stage of maturity when cut, (2) percentage of leaves, (3) green color, (4) amount of heating, spoilage, etc., (5) size and pliability of stems, (6) aroma, and (7) freedom from foreign material.

Quality in roughage, from a chemical standpoint, refers to the

dry matter, protein, carbohydrate, crude fiber, mineral and *vitamin* content.

The chemical composition of roughages depends upon (1) the variety of plant (botanical make-up), (2) the stage of maturity, (3) the climatic conditions (rainfall, temperature), (4) the type and fertility of the soil, and (5) the method of harvesting and conserving the crop.

The quality or feed value of roughages is really measured by *growth, milk production, gains in weight, and reproduction* of the animals consuming them. *The actual feeding value of a roughage, however, can be determined only by feeding trials in which the digestibility or utilization of the food nutrients is measured. Chemical analyses alone are inadequate to gauge quality because we are left in doubt as to the digestible portions. Generally speaking,* the physical factors and chemical composition are sufficiently in agreement that a high grade roughage as judged by its maturity, leafiness, color, aroma and other physical factors, will likely furnish the greatest quantity of nutrients.

The effect of the various factors affecting quality and nutritive value may be briefly summarized as follows:

Variety (legume vs. non-legume). The fact that legumes are higher in protein and minerals than non-legumes is so widely recognized that this fact need not be stressed here, but is clearly demonstrated when a non-legume such as timothy and a legume such as alfalfa are compared.

Stage of Maturity. Immature, actively growing plants contain less fiber, are higher in water content, richer in protein, have more calcium, phosphorus and greater quantities of vitamin A, when compared on a dry matter basis, than the fully matured plant often cut for hay. Practically all of our common roughage and pasture crops have been studied from the standpoint of changes in composition and digestibility of the constituents at various stages of growth, and without exception early harvesting—so far as commensurate with the maintenance of good vigorous stands—is universally recommended. It has been found that such practices result in a

TABLE I

Composition of Barley Plant (dry basis)

Age (days)	Ash %	Protein %	Pentosan %	Cellulose %	Lignin %
21	16.48	38.0	9.3	19.0	2.31
86	7.49	3.7	23.9	31.6	7.74

roughage *higher in palatability, containing more digestible protein per acre, more carotene, a higher mineral content, and generally less fiber and lignin* which so markedly affect digestibility and, in the final analyses, the *nutritive* value. A comparison of the barley plant shows a striking contrast. (Table I.)

The difference in feeding value of early and late cut forages is often much greater than the chemical composition would indicate because as plants mature the percentage of cellulose and lignin greatly increases. Along with increased lignin content we find chemical changes occurring which tend to "bind" or render less digestible the plant nutrients.

Studies dealing with the digestibility and nutritive value of Korean lespedeza by Swanson and Herman (Missouri) indicate a similar picture. Early cut Korean lespedeza hay is about 90 to 95 per cent as effective as good alfalfa hay for growth and milk production, but matured lespedeza hay is poorly digested and in maturing it undergoes much lignification, rendering it low in nutritive value. Matured Korean lespedeza contained only 37.93 per cent total digestible nutrients, whereas the earlier cut averaged 52 per cent and compared favorably with alfalfa. This helps us explain why late cut lespedeza won't make milk! The practical solution, of course, is to harvest such hays early and in an actively growing stage.

Climatic conditions (rainfall, etc.). The amount and distribution of rainfall are paramount factors affecting the yield and chemical composition of forages. Dry matter, protein and mineral content are influenced. Alfalfa grown in a humid climate generally has a higher phosphorus content than that grown in an arid area. During droughts the decreased phosphorus content of herbage is a matter of concern and on range conditions outbreaks of malnutrition among cattle have been reported. In fact, during the late summer the phosphorus content of matured grasses may be below animal needs, particularly in the case of pregnant cows.

Eckles and associates (Minnesota) report these variations in prairie hay from the same farm. (Table II.)

During the winter of 1923 many cases of depraved appetite among cattle on this farm were reported, but they were far less frequent in the winter of 1924.

The New Mexico Station found that generally the forage was highest in minerals during the spring and summer but tended to decrease as the plants matured.

Dairy farmers can offset the effect of drought conditions by

liberally feeding such concentrates as wheat bran, linseed oil meal, etc., and if possible providing fall or winter pasture of rye, wheat, barley, etc. Since moisture is generally the limiting factor in pasture production, it is evident that the soil type also has an effect upon the quantity and quality of the roughage produced.

Type and fertility of the soil vs. feed quality. Plants are materially affected by the mixture or make-up of the soil on which they are grown. Lawes and Gilbert (England, 1900) reported at length upon the wide variation in the mineral content of forages. As early as 1861 mineral deficiencies among cattle kept in certain low areas along the Rhine were reported. Similar cases of malnutrition have been reported from many parts of the world and in badly leached or swampy areas of the United States. Early work as reviewed by Eckles (1926) stresses the relationship of mineral content of feeds to the moisture content of the soil.

There is a preponderance of evidence however, that if soils are high in available plant nutrients it will be reflected in the chemical composition of the plants and likewise in the palatability, yield and the number of animals supported per given area. Not only does the yield of forage increase when soils low in plant nutrients are limed and fertilized, but the amount of nitrogen, phosphorus, calcium, etc., show increases as measured by analyses of the dry plant matter.

Soil fertility also plays an important role in the carotene content of plants. Nitrogen fertilizer increases the green and tender growing parts of the plant and consequently the carotene content. In general there seems to be a definite correlation between the protein and carotene (Vitamin A) content of roughage.

Data regarding the relation of available mineral content of the soils to the mineral composition of the forage grown thereon are voluminous and somewhat contradictory from a practical standpoint. This can be easily understood when the effect of stage of maturity at harvest, method of conserving and management of live stock grazed or fed on these areas is taken into account.

TABLE II

Effect of Rain upon Composition of Alfalfa Hay

Year	Rainfall Inches per Year	Calcium %	Phosphorus %	Calcium %
1923	17.49	5.70	0.173	0.377
1924	21.98	6.18	0.275	0.408

Extensive experiments have shown very little relation between breeding troubles and mineral feeding except in cases where the deficiency of minerals is so great as to actually result in marked malnutrition. Even in such cases a lack of available protein seems to be a major factor in hindering normal body functions. Too, ailments such as "milk fever" and acetonemia are sometimes charged to the poor nutritive value of roughages grown on a given farm, but again this is not borne out by facts. "Milk fever" attacks only the highest producing cows and in the best herds, which are usually on the best farms and likewise receive better than average management. "Milk fever" is generally unpredictable and no correlation between diet and its onset has been observed by practical dairymen.

Acetonemia, or "false milk fever," generally occurs within the first six weeks following calving. It does not seem to be associated with the mineral picture at all, but results from the rapid removal of sugar from the cow's blood and the inability of the cow's body to fully oxidize fats. Administration of soluble sugars generally relieves the trouble.

The soil type seems to exercise its greatest effect on the roughage portion of the plant. Seeds or grains are little if any altered in composition by this factor alone. Also of considerable interest is the fact that the soil type, or the roughage grown thereon, aside from its vitamin A and D content, has no effect on the composition of milk. Attempts to alter the composition of milk by feeding various conglomerations of minerals have universally failed, although where iodine is added to the diet, its increase in the milk is rather striking.

Where soils are low in minerals (phosphorus is usually the element most deficient), the addition of wheat bran to the ration is very important. Likewise the feeding of one to two per cent steamed bone meal in the grain ration is recommended. The calcium and phosphorus from these sources, even though they are of inorganic nature, are readily utilized. Improvement in the soil building program by adequate use of fertilizers, lime, manure, etc., should not be overlooked as the increased yields,

TABLE III

	Protein %	N.F.E. %	Crude Fiber %	Crude Fat %	Ash %
Rained on 1.76" (in field 15 days)	11.01	33.64	38.83	3.81	12.21
Not rained on	18.71	38.71	26.46	3.94	12.18

better palatability, greater nutritive value and soil conservation aspects are of paramount importance.

Harvesting — conserving the crop. Irrespective of the above named factors the nutritive value of roughages depends upon the nutrients conserved during harvest and storage. Unfortunately, there are many areas and occasions where it is impossible to make good hay or silage because of weather conditions. Under such conditions pastures become vitally important as a means of practically furnishing animals an abundance of vitamins and minerals, thus enabling them to function at maximum capacity and produce a milk of enriched vitamin content.

The losses in dry matter and in nutrients are very great in the harvesting of hay under adverse conditions. Rains leach out much of the soluble carbohydrates and proteins, and the loss may be as great as 50 per cent in extreme cases.

There are also many mechanical factors, such as leaf loss, which affect the nutritive value. The leaf generally contains from two to three times as much protein, minerals and vitamins as the stem portion of our common forages harvested for hay. Therefore, harvesting roughages so as to conserve leaves is of vital importance.

Hay which heats during storage undergoes a terrific loss of nutrients. Both the protein and sugar is reduced, figures indicating that these losses may range from 20 to 75 per cent. In severe cases much of the fat and all of the carotene may be destroyed.

Irrespective of how hay is handled, much carotene is lost during the curing process (vitamin D, however, increased because of the action of sunlight). Carotene is also lost progressively while hay is in storage. Old hay nearly always contains less carotene than recently stored hay. Chopped hay loses carotene as well as green color faster than long hay, and baled hay retains its carotene content better than loose hay. Preliminary reports indicate that Korean lespedeza is richer in carotene and retains this valuable vitamin material longer than alfalfa under storage conditions. Carotene (vitamin A) is of concern in practical feeding. It is particularly important that the new-born calf receive adequate vitamin A in the diet. The vitamin A content of milk depends directly upon the quantity of carotene in the feed of the cow. The pregnant cow should receive plenty of green feeds (hay, silage and pasture) so as to provide milk rich in carotene and vitamin A. Dairy cattle require vitamin D. It is recognized that exposure of forages to the sunlight during

harvest increases this vitamin in the roughage. As a rule cattle which are exposed to the sun during the summer and during the winter, as the weather permits, usually obtain sufficient amounts of vitamin D without depending upon the feed as its main source.

The use of the silo is of great practical importance in reducing the losses experienced in storing forage crops. Legumes and grasses as well as corn and sorgo may be stored with a loss of about 10 per cent or less of dry matter, and the vitamin content is proportionately conserved under good silage making conditions.

With our national interest focused on soil conservation, more good pastures, more silos, rotated grazing, and more efficient roughage production is in the picture. A more nutritious milk, particularly from a vitamin standpoint, is in store for the consumer. No doubt these factors will be of great importance in keeping milk in its proper place as the number one table beverage for America.

In summary, it must be emphasized that the quality and nutritive value of roughages are dependent upon a number of interrelated factors. Normally, we obtain our best roughages from plants grown on fertile soils, cut while as immature as continuance of the stand will permit, harvested with a minimum of leaf loss, and sufficiently cured to prevent heating and molding in storage.

Giant Blue Panic Grass

Condensed from Coastal Cattleman

David Morris

FOR years new grasses have been tested and grown to make cattle raising more profitable. Some of these have proven good, others have faded into the past. But this year a new grass, introduced by the U. S. D. A. Soil Conservation Service, from Australia, is now being successfully grown at many points in Texas, Oklahoma and Louisiana.

Although there are lots of things to learn about this grass, the Giant Blue Panicum or Panic, right now it appears to be a very prolific perennial that can yield from 10 to 15 tons of dry hay per year, will test around 14 percent protein in this dry hay

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cut at the proper time, and some tests already made have shown a 22 percent protein value in the green plant. These facts alone make it well worth the time and trouble to test and grow.

After two years of experiments in growing the grass from a small amount of seed obtained from Tucson, Arizona, the S. C. S. experiment station nursery at San Antonio, headed by David H. Foster, chief nursery division; R. J. Matherne, nurseryman, has built up enough seed until the San Antonio nursery now has 16 acres in the grass and there are numerous co-operative plots planted in other areas supervised by the Soil Conservation Service.

The grass has proven a drouth resistant grass, deep rooted and with crowns in the roots to send up numerous stems. The grass reaches a height of six feet or more when grown in 36 inch rows and at a distance resembles Sudan grass. Upon closer inspection the grass is found to have many more stems, to have the blades or leaves growing clear to the ground, the seed heads being borne over the entire plant.

There is the possibility of getting four cuttings a year on good soil and with favorable weather conditions in five or six weeks after a cutting, the stubble will have sent out new shoots that are seeding and ready to cut again. The tonnage per acre of dry hay will of course depend on the number of cuttings, but it looks as if production would range from 10 to 15 tons each year.

Tests have been made on dry hay, both at King Ranch and the San Antonio station, and they show about 14 percent protein after the grain has been threshed. Other grasses in the dry hay tests on protein by the Texas A. & M. College agricultural experiment station bulletins show: Johnson grass 4.47; Dallis 5.72; Bermuda 5.71; Gama 4.16; Texas Needle 5.58; Salt Grass 4.36; Big Bluestem 3.64; Buffalo 6.16; Georgia 4.13; Little Bluestem 3.64; Carpet 4.03; Rhodes 3.25, and Angleton grass 3.58.

In checks made by a commercial feed manufacturer, but not official, plants cut when from 14 to 16 inches high, showed a protein content of 22 percent.

So far Panic grass has done well on black land and on land that can be irrigated. If water stands too long over the root crowns it seems to drown out. However, at Alice, where one field of two acres stood almost three months without rain and the Bermuda and Rhodes grass died, the Blue Panic turned brown, but within three weeks after rain the new plants were three and four feet high, showing it a good drought resistant grass.

At Goldthwaite, where the

grass had been planted on cut over land and very poor soil, it was doing well and goats were really thriving on it. So far no real tests have been made on sandy land, and there is some doubt as to how it will do on sand.

It is felt that the land would have to be fertilized every two or three years in order to maintain yield. The planting of the crop in rows and the planting of legumes in between and the plowing under of this green fertilizer is thought to be one way to keep it producing. As it is a perennial, the rows might also be side-dressed with fertilizer every few years.

As the seed germinate immediately after becoming ripe, and as those that fall from the plants in the field come up in the middles, results thus far have shown that plowing the middles between each cutting will help keep the Panic from becoming too thick and possibly smothering itself out.

Tests at the King Ranch on planting the grass in the pastures along with the other grasses have shown that it comes up and grows well. Their pastures this year were grazed very heavily during the dry season and the grass was nipped close to the ground. Whether it will come up and grow again is still to be seen.

The grass has withstood temperatures as low as five below zero in Louisiana. How far north it will grow is yet to be determined, though it is known to be doing well this year in several parts of Oklahoma under S. C. S. plots.

"Down here at our San Antonio breeding plots for our various grasses, we have had fine results with the grass," Mr. Foster said. "Unofficially on February 28 of this year about 100 head of our cattle were turned out in our grass growing plots, where some 15 different kinds of grasses are being grown. We have 16 acres of the Blue Panic here, about the same acreage of perennial Sudan, and many other kinds.

"The cattle grazed about over the entire plot for some two hours before they reached the Blue Panic. That night we had to drive them from the Blue Panic area and on four days following the cattle immediately went for the Blue Panic and grazed on it throughout the day.

"We have thrashed the Panic for seed and have found the cattle will eat all of the dry stalk after it comes out of the thresher. The stalks are brittle, sweet, and undoubtedly high in food value.

"We have no official reports on the amount of feed that can be obtained from the grass; at present actual figures run from 60 pounds to 209 pounds per

acre. When the grass is cut with combines there are lots of seed that are not harvested, because they grow close to the ground and on top of the plant. Where they have been cut with a row binder and then threshed, the highest yields have resulted. In planting we have found that it takes about two pounds of uncleaned seed or one pound of cleaned seed per acre. The seed are very small and an onion plate or a plate even smaller should be used.

"On germination we got 70 percent on the Panic in seven days and a final 84 percent count. Sometimes on Rhodes we get a perfect stand in three days, but the Panic will make a perfectly seeded plot in one year, while it takes the Rhodes about two or three years to become well rooted. The Panic will also grow faster than most weeds and grasses and thus will crowd out the undesirable plants."

An outstanding farmer who has become interested in the grass and now has considerable acreage planted and hopes to have some 2000 acres in the grass next year, so that more seed can be made available, is C. E. King, of Houston. Mr. King has a large farm at Alice, where C. N. Freeman is his farm manager and is growing the grass. From two acres this summer they have seeded some 50 acres that they hope to get at least one seed crop from this fall.

At or near Austwell, Mr. King and his brother have another planting of the Panic. The seed on these farms will be grown under the supervision of the Texas Seed Certification Department of the State Department of Agriculture and checked by the Seed Laboratory division for purity and germination.

R. V. (Bob) Miller, chief of the certification department, says that of course there are no standards set up for the Blue Panic, because it is so new. He is now working on standards for this grass. Linden E. Jones, chief of the Seed Laboratory division is properly fitted to make the germination and purity checks when they are needed.

Finally, this much should be said: The grass is proving very encouraging; it looks like the answer to many a livestock farmer's desire for a perfect pasture grass, as well as a hay crop. But this fall there is no seed available for general distribution, and it will be summer, 1945, before any large amount of the seed can be expected. As it seeds very heavily and grows so fast, within a year or two every one should be able to make a check of the grass on his own farm and ranch, and only then, will each individual be able to know what to expect from the Giant Blue Panic grass.

A "Sure Enough" Push Button Barn Cleaner

Condensed from Electricity on the Farm

Geo. W. Kable

THERE is probably no less loved job on the dairy farm than cleaning the stable. It is not an easy job, nor a choice one; but it has to be done.

Recently I saw a barn cleaning arrangement that would cheer the heart of anyone who has grown up pushing a four-tined fork. It was simple, practical and not too costly. This gutter cleaner is on the Hillandale Farm of Mr. Fred H. Shepherd, Oconomowoc, Wisconsin. It has been in use for over three years, is still cleaning the barn twice a day, and looks like new. Mr. Shepherd told me the cleaner was the invention of a neighbor, Mr. Wm. C. Boldt, of Hale's Corners, Wisc., who has a patent on the device. Other Boldt cleaners have been in use in two farm barns, one for eleven years.

This cleaner is pre-eminently suited to barns where the cows face out, and where a manure pit or drive-way for the spreader can be placed at one end of the barn and so the top of the spreader will be below the barn floor level. The cleaner consists of an endless straight link chain with wood scrapers attached that fit into the gutters. The chain is pulled through and around the ends of the two gutters by a motor, through a gear reduction which gives it a travel speed of about 18 feet per minute. In Mr. Shepherd's 26-cow stable the cleaning time is about 6½ minutes.

There are two fixed grooved idler pulleys to guide the chain out of one gutter and into the other. At the drive end there is a 16-inch cog wheel which drives the chain and a 14-inch grooved idler in a steel track imbedded in the concrete floor. This idler is adjustable for taking up slack in the chain. It is important to have an even number of links in the chain and it must be put together without a twist.

The chain is of ⅞" iron and is approximately 170 feet long. The cleats or pusher strips are of 2" x 2" oak, spaced every 20 inches. They are about one-half inch shorter than the gutter is wide. In the Shepherd barn, the gutters are 16" wide and the cleats 15½" long. The pusher strips are attached to the chain with heavy-duty escalator castings. The chain, escalator cast-

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ings, drive gear and idlers were secured from Mr. Boldt. The Ford rear end, pump-jack gearing and motor were purchased second hand. Most of the work of installation was done by Mr. Shepherd. He estimates that the cleaner, as he has it, could be installed for about $200.

Although these cleaners have been in use a number of years, they have not as yet been made or sold commercially.

As soon as the switch is closed and motor started, the manure starts moving in both gutters. From the one gutter the manure is dragged directly into the spreader. In the other it is carried in the opposite direction around the end and then down the clean gutter to the spreader. When it has all been moved out, the switch is pulled. Since the chain is endless, it has no exact starting or stopping point.

The idler wheels and connecting gutter at the end of the barn are covered over with iron plates. Mr. Shepherd says the manure does not clog or lodge when going around the end if the barn is cleaned twice a day. The clearance under the plates is not sufficient for a full day's load. In the straight sections of the gutter it does not matter how deep the manure is.

The drive mechanism consists of a 2-horsepower, 1,750 rpm motor geared roughly 400 to 1, so it will drive the 16-inch drive sprocket at 4½ rpm. A reduction of 83 to 1 is obtained with a worm geared model T Ford truck axle and a John Deere pump-jack drive used as a speed reducer. There is a 5 to 1 reduction in the belt drive from the motor. Both the axle and jack run in oil and need no oiling or attention. The drive sprocket is attached to one end of the Ford axle.

Mr. Shepherd had these comments to make about the cleaner. This will be my fourth winter with it. Nothing that I have built has been so satisfactory or trouble-free. Next to labor saving, I think cleanliness is the important thing about the barn cleaner. If the floor between gutters is white when you start the cleaner, it is still white when you get done; and the operator and cows stay clean, too.

All Pullet Flocks May Be Post-War Necessity

Condensed from Poultry Tribune

Roy E. Jones

University of Connecticut

UP TO the present time, the poultry industry has been making ever-increasing progress in breeding, production, management practices, total volume, and market outlet. There has been no limit to the field of expansion open to endeavor and enterprise.

Today, the poultry industry has come to a crossroads where expansion is cut off. Production actually exceeds demand and the poultry industry, as a whole, must decrease. Eventually, whether we prolong price control as a temporary expedient or not, we are going to have to fight it out on the line of production economy. Those farms and those areas where poultry and eggs can be produced and placed in the hands of consumers most economically, will maintain. Every good poultryman must devise the most practical way for him to set his house in order for economical production.

Good breeding is recognized as the No. 1 requirement for production economy. Tremendous progress has been made in livability, rate of feathering, rapid growth, greater production, egg size, and even egg quality. Unfortunately, the highest quality breeding is not plentiful. It is found by seeking out the breeder who is doing special breeding work, and it is identified only by the production records of his customers. Many of the benefits of good breeding in the third and fourth generation are distributed more widely, and their effect on annual production is felt very definitely.

There is probably no management recommendation on the commercial egg farm more important than keeping nothing but pullets. Even the hatching egg and breeding farm cannot afford to keep any old hens except the superior ones that have been selected carefully, and the offspring from which will be used carefully for improvement.

Under average Connecticut conditions, this difference is approximately 50 eggs per bird, and those 50 eggs per bird may be the total profit. Pullets should lay heavily throughout the first lay-

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ing year. With proper management, they may lay even 14, 15, 16, or even 17 months straight before they are disposed of. Comparisons, however, are made on the basis of the calendar year. A hen should molt out of her second year, which means she has only approximately 10 months to lay at best, and her rate of production is considerably lower than her rate of production as a pullet.

Mortality is usually less in the pullet year than in the hen year. Furthermore, if the old hens are disposed of, or if they do not come in contact with the pullets, some troublesome disease problems are taken care of, and pullet livability is stepped-up another notch.

Early hatching is essential for greatest production economy. Early hatching in the Northeast means from January 15 to February 15, or at most, not later than March 1. Early hatched pullets live better, grow faster, and mature quicker than late hatched pullets. Early hatched pullets may lay more small eggs because they start laying at an earlier age, but egg size at the same age should be approximately the same. Pullets should be hatched sufficiently early to improve in egg size and be laying a standard size egg during the late summer when conditions are favorable, consume a sufficient amount of feed to maintain a heavy rate of production and, at the same time, complete their growth and build up a reserve of energy to carry through the winter.

Brooding and rearing a large number of pullets of one age at the same time reduces brooding costs and makes it possible to do a better job. Having a large number of pullets maturing at one time to be housed for egg production, makes it possible to do a better job of feeding and management. Laying pullets, housed in July, in houses with insulated ceilings and large north openings can be kept comfortable and in heavy production throughout the entire high egg price season and the following year. Trapnest records on R.O.P. farms indicate that the early hatched pullets lay considerably better than the later hatched pullets of the same breeding.

Pullets should be selected carefully when they are housed, and culled regularly after they are housed. If pullets are good and production is high, there will be very few to take out. If pullets are not good and production only moderate, there will be a considerable number to take out, but it is more economical to take out such pullets and sell them while they still have good meat value than it is to hold them with unsatisfactory production. If pullet culling is heavy during the fall,

it may be wise to have a second lot of pullets about one-third or one-fourth as large as the first lot of pullets ready to fill vacancies about November 1. If this practice is followed, every available foot of floor space will be filled with laying pullets from July through to the first of January. If pullets do not make a profit during this part of the year, there is very little probability that they will make any profit during the year.

If poultry conditions become extremely difficult and egg prices from January 1 through to July are too low to allow a profit, early hatched pullets may be disposed of in December or January after they have made a satisfactory profit on fall eggs. Early hatched pullets are very near maximum weight during that period. Spring prices are usually good, and the pullets bring considerably more than they would the following summer or fall. Many poultrymen have followed this practice over a period of years and they have made money. This system of management allows ample floor space for brooding all of the pullets than can be housed the following July, with sufficient floor space for excellent development during the early part of the brooding season until they can be placed out on range in shelters.

Laying houses usually make excellent brooder houses. This practice reduces labor and total volume production, but increases production during the high egg price period. It fits in well with the need for poultry reduction without putting poultry farms out of business. It increases production during the period of shortage, and reduces production during the period of surplus. This practice would not be practical except where the entire flock is early hatched pullets.

More Meat—Less Lard on the Post-War Hog

Condensed from The Ohio Farmer

J. S. Coffey

Animal Husbandry Department, Ohio State University

If one is to draw conclusions from present trends in hog type there are varying opinions on what the correct type will be or should be when the present conflict ends and we attempt to re-establish ourselves on a normal economic basis.

Just prior to the beginning of World War II, there was a lard problem with which pork producers and processors were attempting to cope. This problem was in the form of lard surpluses which had a deteriorating effect upon pork prices and which taxed the storage facilities of processing plants. There was consequently a mutual interest between producers and processors on the subject of the lard problem.

Upon a complete survey of the situation, two very simple alternatives presented themselves as possible means of solving the problem. These were:
Stimulation of lard consumption.
Reduction of lard production.

Stimulating Consumption of Lard

This phase of the problem was largely a processors' responsibility. In attacking the problem it was seen immediately that some means of meeting the claims of competitors in the lard substitute field must be devised. This in turn meant that a product must be placed on the market meeting all the quality specifications claimed by substitute manufacturers, and that it must be available at a price which would be attractive to consumers.

The National Live Stock and Meats Board along with certain packing interests accepted this challenge and immediately set in motion research activities leading to the improvement of lard and demonstrating its value as a shortening medium in cookery. This research demonstrated some very definite points of superiority in favor of lard over lard substitutes including more complete digestibility, and superior physical benefits to the consumer. This latter claim was centered about the benefits of lard to patients suffering from skin ailments—specifically eczema.

In spite of these discoveries, however, it was recognized that lard had certain shortcomings which gave substitute manufac-

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turers an advantage in their advertising propaganda. Chief among the faults of lard were, melting at a low temperature and a tendency to become rancid when exposed to air for any length of time.

Research by one of the big packing houses at Chicago resulted in a bland lard product which definitely was without these two faults. These accomplishments placed the processor in a position to counter all advertising propaganda which by innuendo had pointed out the faults of lard.

This recapitulation of the lard situation is set forth because it represents the efforts that were necessary before it was possible to begin a campaign designed to stimulate greater lard consumption. When all conditions seemed ripe to launch an advertising campaign for lard, along came World War II with its many and varied price regulations, and its demands for fats, which made further progress in lard sales advertising practically impossible. The machinery however, is set for entering lard in the field of food shortenings, without apologies, when once the post-war era arrives.

Reducing the Lard Supply

While stimulating lard consumption is largely a processor's problem the matter of cutting down the supply is mostly the producer's responsibility. We need not deceive ourselves into believing that lard will drive substitutes out of the field of competition. Following the war we may expect a plethora of vegetable fats of all kinds and description including mostly those derived from soybeans and cottonseed. Sharp measures will be used to market these oils, and pork producers had just as well recognize this fact. It therefore behooves the pork producer to do all he can to keep the total output of lard at a minimum level in order that his product may not become a drug on the market.

There are two means that may be employed by producers in keeping lard fat down to a minimum. These are:

Marketing hogs at lighter weights, and

Developing a meat-type hog which carries a minimum of lard in its carcass.

Marketing at Lighter Weights

This is something in which the producer and packer buyer can cooperate. If the packer will discriminate sharply against heavy weight hogs as regards prices, then producers will see to it that their hogs are marketed at lighter weights. Then, too, it is a matter of economy for the producer to market his hogs at a younger age and at lighter weights because the cost of production is cut very sharply. For

instance, pigs weighing between 150 to 200 pounds require approximately only 435 pounds of feed per 100 pounds gain, while from 250 to 300 pounds the feed requirement for each 100 pounds gain is about 100 pounds more.

It is true that in feeding a pig for market, much of its gains up to 200 pounds is in the form of muscle development. Above the 200-pound mark a higher proportion of the gains is in the nature of fat. Thus in feeding to heavy weights the producer finds himself in the position of getting gains at an ascending cost, which at the same time have a descending value. Furthermore, a persistent policy of feeding to heavier weights serves to add to fat surpluses, something we need to avoid if pork prices are to be protected.

This phase of swine breeding is something upon which breed promoters are uniformly agreed. There is a genuine desire in all quarters to develop a strictly meat type hog, which means a type having a maximum of edible meat in the carcass with a minimum of lard. Again we have something that is easier to name and discuss than it is to realize in breeding performance.

Most breed promoters are a bit wary on this meat type business for fear a type of hog may be developed resembling the rangy shallow hog seen so frequently in the early twenties. No one seems to want this type. On the other hand if we really want a meat type animal, then certainly we must get away from the thick chubby kind which at the moment seems to have captured the fancy of many western Corn Belt breeders.

No doubt we can do much in approaching a meat hog type thru visual selection, by emphasizing thickness, firmness and trimness of seed stock. On the other hand this method of selection is not entirely dependable. Many carcass cutting demonstrations have shown that what appeared to be a meat type animal, in reality, was quite lardy.

Developing a Meat Type Hog

If breeders wish to become really serious on this matter of developing a meat type, it will be necessary to make killing tests of different lines of hogs within a breed. Such tests would be similar to the improvement methods practiced by Danish breeders in their development of the Landrace hog. In more detail this process involves the keeping of records on reproduction, feed costs and the slaughter of a specified number of a litter in order to determine the meat producing qualities of that litter. This of course involves a number of tedious details, with which the average breeder would not want to burden himself.

It is entirely conceivable that sometime in the future capable testing laboratories will be established, properly equipped to test litters as to feeding ability and carcass producing ability. Breeders would then have an opportunity to consign litters to these laboratories, from which dependable results should be obtained.

The entire future of progeny testing in the case of hogs is in a nebulous state. However, this writer is convinced that dependable results in swine improvement must arise from some type of testing. The swine organizations have recognized the importance of testing and each of them has gone as far as it can in organizing some type of merit recognition for herd boars and brood sows.

This recognition, of necessity, has been based mostly upon the reproduction ability of the sow plus her ability to nurse pigs to a specified weight or above in a specified number of days. While this is a step in the right direction, it does not include carcass testing or gaining ability from weaning time to a marketable age. The complete testing must include these important phases if we learn all that we should know about our seed stock.

Fertilizer Makes Farm Acre Larger

Condensed from California Cultivator

R. E. Stephenson

THE California experiment station reports 12-year-average results in which orange yields were more than doubled by the use of nitrogen fertilizer to supply one pound of nitrogen per tree. The Indiana station reports a corn yield of 55 bushels an acre with 1000 pounds of 16-8-8 fertilizer applied by the plowsole method on land that yielded only 14 bushels without fertilizer. An additional 100 pounds of 3-12-12 fertilizer applied in the corn row at the time of planting brought the yield to 65 bushels an acre. Much reliable data indicate similar responses from fertilizing other crops.

The present need for increased production and the high prices, justify more liberal use of fertilizers than is the practice in normal times. As the amount of fertilizer increases, yields also increase until the full capacity of

Reprinted by permission from the California Cultivator, Dec. 23, 1944, Los Angeles, Cal.

the land is reached. Orange growers sometimes use two to three pounds of nitrogen, equivalent to ten to 15 pounds of ammonium sulphate or sodium nitrate per tree, as the tree gets older and larger.

Farmers seldom have time to keep records of yield increases from fertilizer treatments. Good farmers are using fertilizers profitably, however, and the amount consumed is gradually increasing. Still greater profits could probably be realized with more liberal fertilization, allied with other good practices. A ton or more of high-grade fertilizer an acre has been profitably used for specialized crops yielding high acre returns. When prices are high, about the only limit to the amount of fertilizer that can be used on specialty crops is the supply of fertilizer that can be obtained. For example, English walnuts at 25 cents a pound bringing $500 an acre may justify as much as $50 an acre for fertilizer, assuming that there would be increased yields.

Doubling the yield per acre has the same effect as doubling the number of acres in crop so far as total production is concerned, and may prove far more profitable. At present, about all the available acres in production and total acreage for most crops cannot be much increased. The ambitious individual may purchase his neighbor's farm, but usually only at an inflated price. Rather than increase his number of acres at inflated prices the individual farmer would probably be better off to increase his production per acre by better farming and more efficient use of fertilizers.

To purchase more land means a greater investment with interest and taxes to cover in the returns. To increase the yield per acre, however, may require only a relatively small expenditure which is profitably returned by immediately increased production. When one acre can be made to produce what two acres formerly produced, there are only half as many acres to plow, cultivate and harvest, which is a material help in a labor shortage. Perhaps it would be more helpful to increase the yield than to increase the acreage in crops.

Fertilizers are usually most effective on soils well supplied with humus. Farmyard manure, compost and green manures are especially satisfactory sources of humus. Fertilizers can be profitably used on green manure crops to grow more humus materials. A good cover crop growth, worked down while green and succulent, may put new life into an old soil.

For effective use of fertilizers, the grower must have an understanding of the needs of his various crops. To add two tons an

acre to the yield, an alfalfa crop must be enabled to utilize an additional amount of phosphorus and potassium equivalent to 350 pounds of superphosphate and 450 pounds of muriate of potash an acre. This nutrient may come from an improved soil or it may be supplied as commercial fertilizer. Alfalfa is a legume and should be able to obtain the needed nitrogen from the air, assuming that the seed was well inoculated. A nonlegume would probably need nitrogen also.

The critical need of the alfalfa crop might not be either phosphorus or potassium, however. It could be sulphur or some other nutrient. Land which yielded one and one-half tons of alfalfa an acre was treated with 200 pounds of gypsum to supply sulphur. The alfalfa then was able to obtain from the soil all the phosphorus, potassium, calcium, magnesium, iron, manganese, copper, zinc and boron necessary to produce a four and one-half ton harvest. The problem of tracing down the limiting nutrients to correct the deficiencies that control production is sometimes difficult, but not an insurmountable problem. Due to the work of state experiment stations, aided by the experience of farmers, the serious nutrient deficiencies can usually be spotted soon after they appear and the proper corrective measure may be applied to the next crop.

Then, as the right fertilizer or soil treatment is used and in adequate amounts, yields and profits increase. Not infrequently one acre may be made to yield as much as two or more formerly produced. There is no more effective way to make the farm acre bigger than through increased yields, brought about by the intelligent use of fertilizers, associated with other good practices.

To Strip or Not to Strip?

Condensed from Certified Milk

George H. Hopson, D.V.M.

Veterinarian, DeLaval Separator Company, New York City

ONE of the most frequent questions asked by dairymen in relation to better milking is: *Should I or should I not strip my cows?* Let us take a moment and define what is meant by stripping, and why so many dairymen consider it important.

Among dairymen "stripping" is a word of broad meaning. For the most part it means removing the residual milk left in the udder, if any, by hand-milking after the milker units have been removed.

Then, again, we hear the term "machine-stripping." This means that the residual milk is removed from the udder while the machine is still attached. The operator usually pulls down slightly on the teat-cups with one hand, while he manipulates the quarters with the other.

Machine-stripping is becoming more and more popular every day. Adherents of this practice are generous in their praise of its advantages. It is a fact that a much cleaner milk can be produced by machine-stripping. This, of course, allows the milk to strain more rapidly.

First let us determine whether or not a cow needs to be stripped, for there are many cows in every herd that milk out quickly and completely. First-calf heifers and young cows, if properly milked, seldom require this extra attention.

The need for stripping can best be determined by an inspection of the udder. This so-called inspection or examination is actually to keep close watch of the units and udders.

When the lower part of the udder becomes soft and flabby it is an indication that the gland is empty, or nearly so. If the teat-cups start to "crawl" this is another indication that the animal is about through milking.

At this time the operator should examine the quarters. If the glands are empty the teat-cups are removed immediately and the animal should be considered milked dry, with no stripping necessary. However, if a

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small amount of milk is locked in the lower gland sinuses it is well to pull down slightly on the teat-cup assembly with one hand, using the other hand to massage the quarters. This is called machine-stripping.

There is a knack to machine-stripping, and the manner in which it is performed is important. The pull on the teat-cups and massaging of the quarters should be simultaneous with the pulsations. The stripping act should never be prolonged; it takes only a few seconds to accomplish this purpose and nothing is gained by prolonging this act.

In some operations machine-stripping requires less help, as the machine operator usually inspects the udder and machine-strips the same cows to which he applies the units. Under ordinary barn conditions one operator has all he can do to operate two units and machine-strip. A transfer pail and slip cover are also essential so that he can change operating heads quickly, without loss of time.

Hand-stripping is the most common practice on the farm today, although machine-stripping is fast taking its place.

With the latter method the udder should be inspected immediately after the units have been removed. If there is residual milk present, three or four hand-squeezes on each teat should be sufficient to remove it, in most cases. Prolonged hand-stripping is entirely unnecessary and may lead to the objectionable habit of cows giving large amounts of strippings.

Do not forget that it is *impossible* to get that very last drop of milk—it will be there at the next milking. Do not worry about the butterfat test; the very last milk which tests so high will also be obtained at the next milking.

In better milking herds the average stripping weights are from .1 to .5 of a pound per cow. Cows that give a pound or more strippings should be considered incompletely milked and the reasons for this should be ascertained and corrected if possible.

Low vacuum will cause cows to give excessive strippings. This may be due to a stoppage in the vacuum line with not enough vacuum to properly open the ends of the teats and to carry the milk to the pail.

Liners not at proper tension or in poor repair may be a major cause of incomplete milking. Leaky and worn pulsators are also a common cause.

All of these mechanical defects can be easily detected by a service man and quickly corrected.

Faulty preparation of the animal for milking is often the cause of incomplete milking.

It will be found that some dairymen are using too many units. This makes it impossible to get back to the first unit applied, when the cow has been milked. It is necessary to do so as a unit left on a cow after she has been milked out will tend to make her a slow milker. Fewer number of units, operated correctly, will not only milk better but will milk more cows per hour.

Observations in the field indicate that two men can operate three units more satisfactorily than they can four units. Of course circumstances alter cases. In large commercial herds where full-time operators are employed, from four to six units are handled.

When machines are purchased the number of units to be decided upon should not be judged by the number of cows in the herd, but by the amount of help available to operate the machines.

Minor irritations of the skin of the teats are at times very painful and will cause a cow not to "let down" her milk.

The most common condition found is chapping, due to one or more of several causes . . . wet bedding, wet hand-strippers, overly strong disinfectants, sloppy and wet barnyards. Secondary infection may enter the broken skin surface and set up added inflammation. Long-necked warts that become irritated and cow-pox lesions are also painful. Any of the above-mentioned conditions should be carefully studied and corrected.

In many instances pathological changes in the udder may be the reason. It is best to consult your veterinarian on the proper method of milking these cows. Cows with healthy udders always milk better.

As cows grow older and pass through successive lactation periods, certain normal changes occur within the udder. Sometimes pockets will form in the lower part of the udder, preventing free drainage.

Not infrequently scar tissue will form at the end of the teats or in the teat-canal, due to work or aging of the tissues.

Then the udder attachments start to break away, creating different positions of the tubules and connecting sinuses, which would restrict the free passage of milk to the lower part of the udder.

Incomplete milking is an indication of something wrong in the milking routine. Do not accept it as a necessary evil but get to the bottom of the trouble and correct the condition.

Even after the cause has been found and corrected, it will take some time to train the cows to complete milking once they have developed this objectionable habit. The best way is to strip

the cows out quickly and take what milk can be readily obtained.

Finally, remember that every gland should be examined or inspected at the conclusion of the milking act. Strip by machine or by hand only those cows that need to be stripped.

Endeavor to build up a herd of cows that do not require stripping.

Feeding Moldy Silage

Condensed from The Jersey Bulletin

Is it safe to feed silage containing molds to dairy cows? This question is often raised by farmers and is answered by C. C. Hayden, of the Dairy Department at the Ohio Agricultural Experiment Station.

Molds are living plants and like other plants, only a few of them are poisonous or produce poisonous products. Some of these few may develop in silage and cause "forage poisoning." The molding of silage is one step in the process of decay and it is certain to be accompanied by the growth of other organisms, including bacteria. Many bacteria are beneficial or harmless, but, like the molds, a few of them produce harmful products. A few of the harmful molds and bacteria find a suitable place for growth in decaying silage.

Man can rather easily learn to recognize the poisonous plants which grow in pastures, but it is difficult to learn to recognize at sight these poisonous plants growing in decaying silage. Their presence is made known only when poisoning or severe digestive disturbances occur and are proved to be due to silage. There is a strong tendency to attribute such troubles to silage when the cause may be elsewhere. However, moldy or off-flavored silage should always be considered a possible source of danger and as much of the mold as possible should be thrown out.

Large amounts of moldy silage have been fed without apparent harmful results, and, compared with the actual numbers of cows being fed such silage, the cases of poisoning are rare. Large amounts of silage containing some mold should not be wasted, but should be fed with care. Such silage, although not harmful to the cow, may develop bad flavors which may be carried over into the milk. The presence of much mold indicates a poor silo or a faulty method of making the silage.

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Dressed Poultry

Condensed from New Jersey Farm and Garden

J. C. Taylor

POULTRY meat is an established favorite of American people. More people are eating poultry meat now than at any time in the industry's history. The estimated per capita consumption for 1941 is twenty-eight pounds. This great demand for poultry meat has created a very profitable market for dressed poultry and many growers are taking advantage of this demand.

The result of a good job of dressing is an attractive carcass —one that will influence the buyer to come back for more. There are a few simple practices that should be followed in dressing poultry to produce a finished carcass, attractive in appearance.

Birds to be killed should not be fed for at least twelve hours before killing. During this period the birds should be held in well-ventilated rooms and not become overheated. A good supply of drinking water should be given the birds during the "starvation" period and only removed two hours before killing. This supply of drinking water will aid in keeping the birds cool, help in removing waste products from the body, keep the flesh firmer, keep shrinkage low, and permit the birds to bleed out more thoroughly.

Elaborate and expensive equipment is not necessary. A poultry killing knife with a three-inch blade is used for poultry and one with a four-inch blade for turkeys. For holding the bird, commercial shackles are preferred; they hold the legs apart and prevent bruising. A very satisfactory shackle can be made from sash cord with a wooden button two inches square on one end.

Blood cups will vary in size depending on type of poultry being killed. For small broilers up to three pounds, the cups should weigh about three-fourths to one pound. A cup weighing two pounds is used for fowls and roosters. Turkeys require a heavy cup weighing at least five pounds. Blood cups can be made at home from fruit cans. The quart size is most popular with a wire hook in the side, held in place by concrete which also gives the weight to the cup.

Scalding vessels will vary in size, depending on the number of birds to be dressed. They should be large enough so the bird can

Reprinted by permission from New Jersey Farm and Garden, Jan., 1945, Sea Isle City, N. J.

be immersed thoroughly and easily. For an average sized chicken a sixteen-quart vessel is used. For turkeys, one with a capacity of fifteen gallons is satisfactory.

For markets, birds should be bled by cutting the blood vessels in the neck just below the base of the skull, and killed by piercing the rear lobe of the brain. This method, when properly done, insures good bleeding.

When it comes to removing the feathers, there are three methods available: Hot-scald, semi-scald, and dry picking. Most poultry is picked by the semi-scald (sometimes called slack-scald) method.

The hot scald generally is used for birds consumed at home or within two or three days, or before the skin turns red or brown. If the skin is kept moist, the brown spots do not appear so quickly. Fat carcasses retain the natural fresh color for a longer time because the fat forms a coating over the scalded skin. The lower thighs usually turn red first because there is little fat in these muscles and skin.

Properly-scalded carcasses do not turn red or brown, but retain a natural bloom.

Power picking machines were growing in popularity before the war with growers who were dressing fifty or more birds at a time. These machines have a drum about the size of a laundry tub with rubber fingers the size of a garden hose. The drum is driven by a motor. Chickens picked by machine are first semi-scalded and the carcass held against the revolving rubber fingers of the picking machine.

After the bird has been picked and all pin feathers removed, the carcass should be cooled. Cooling the carcass after the feathers have been removed adds to the keeping quality and also makes it easier to clean. Good cooling temperature is thirty-five to forty degrees, which allows the animal heat to escape but is not cold enough to freeze the carcass. A common practice of cooling is to immerse the carcass in cold water for about an hour to remove the animal heat.

Developing a reputation now for high-quality dressed poultry will insure you a market for your poultry meat when the war is over and the industry is faced with competition of the high-quality red meats, which are not now available.

Winter Dysentery Penalizes Milk Production

Condensed from Eastern States Cooperator

Dr. W. J. Gibbons
New York State Veterinary College

WINTER dysentery is a contagious disease occurring in stabled cattle in the winter months and early spring, characterized by diarrhea, a marked decrease in milk, and a partial loss of appetite. The disease is transient and fatalities are exceedingly rare. Winter dysentery is widely prevalent in northeastern United States from the Atlantic to Ohio, and probably occurs in other sections. Seasonal occurrence is chiefly from December to March and in affected areas appears on many farms each winter.

Winter dysentery has been attributed to various causes. Because of its sudden development, often after use of a new supply of grain, there is a tendency to attribute winter dysentery to the "feed," but under present conditions, commercial grain mixtures cannot be conceived of as causing the disease.

In 1930 and 1931, Doctors Jones and Little of Rockefeller Institute investigated and discovered that it was a bacterial disease caused by a little, crooked, motile germ, scientifically known as a vibrio. Because this germ usually affects only the middle part of the small intestine, these eminent scientists named this microbe *Vibrio Jejuni.*

When this germ is carried into a herd, winter dysentery makes its appearance in three to five days. As a rule, it appears in several herds in the same neighborhood; and it may spread along a road from herd to herd for several miles; this manner of spreading helps to differentiate it from dysentery caused by feed. Infection may be carried from diseased to healthy herds by persons or animals. The germ is eliminated in the manure and is very frequently tracked from herd to herd by cattle dealers, milk testers, or other visitors.

Frequently the owner inspects his neighbor's sick stock and returns with the infection to introduce the disease in his own herd. The onset manifests itself with a few cows with a fetid, watery diarrhea, which soon spreads to the whole herd. Milking cows suffer from loss of appetite and

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many show an enormous decrease in milk supply. A few may cough, and in severe cases, may pass slight amounts of blood. It is very seldom that a fatality occurs.

Winter dysentery is a disease which usually runs a course of about one week. The greatest economic loss is not in the death of any affected animals, but in the great loss of milk production and condition which will be regained only gradually.

Diagnosis of winter dysentery seldom presents any difficulty. Presence of the disease in the neighborhood, characteristic brownish diarrhea, or "black scours," lack of fever and the fact that this disease is seldom fatal and usually self-limiting, differentiate it from other diseases. In severe cases, presence of blood in the manure may lead one to suspect coccidiosis. Coccidiosis is mainly a bloody diarrhea and may cause deaths. Usually it affects only a few young animals. Winter dysentery affects adults and usually the entire herd.

In the treatment of this condition, withdrawal of heavy feed and silage is important. Feeding of dry hay and a small amount of a good grain ration is recommended. The disease will generally run its course in any given herd and not cause any deaths, but it will usually pay the dairyman to have his local veterinarian prescribe for his cattle and shorten the disease, and, likewise, bring his cows back to quicker production.

Administration of intestinal antisceptics, astringents and protectants are indicated. In the treatment it is usually best for the cattle owner to have his veterinarian treat the animals and prescribe some anti-diarrheal medicine than to depend on bulky homemade drenches, which the cow may inhale and thus cause pneumonia.

In many outbreaks of this disease the herd is left in poor flesh and off-production. Many of these herds can be brought back into economical production by good care and intensive feeding of concentrated grain mixtures.

In preventing the spread of this disease, dairy herd owners should be very careful in allowing visitors into their barns without permission. The use of signs or posters at the doorways and at the end of the feed alleys is to be recommended as a preventive of winter dysentery and other contagious cattle diseases.

Many outbreaks of winter dysentery have been erroneously diagnosed as an intestinal form of "shipping fever," or hemorrhagic septicemia, and the cattle vaccinated against this disease. The intestinal form of shipping fever is very rare. In outbreaks of shipping fever, there is usually the history of the introduction of

a new animal, the sick have a high fever, symptoms of pneumonia are usually present in some, diarrhea if present is usually secondary and does not have the characteristic appearance of winter dysentery. Deaths are frequent in the first taken sick. Cattle owners should depend on their local veterinarian to differentiate between these conditions early in the outbreak. Shipping fever bacterins or "vaccines" take at least a week to produce immunity and, therefore, cannot aid in checking winter dysentery. The use of shipping fever vaccination for winter dysentery adds a needless expense to the owner's loss, and generally is not necessary unless the owner's veterinarian considers that there is a reasonable possibility of shipping fever. In such cases, it may be good insurance.

Early-Hatched Pullets Pay

Condensed from Everybodys Poultry Magazine

John Vandervort

RALPH BELL, of Greene County, Pennsylvania, has a unique plan of handling January and February hatched pullets. After the early brooding period, they are moved to shelters and remain there until the entire flock is sold for meat early the next year after the pullets have laid for approximately six months. One might say that he is keeping layers without a laying house.

Starting in 1941 with a few hundred early-hatched pullets, Bell gradually increased this market egg and meat enterprise until he started with about 2,000 New Hampshire pullet chicks in January, 1944.

Chicks are brooded in colony houses with wood-burning stoves. When the chicks no longer need heat, they are transferred to shelters 14 feet wide and 20 feet long.

In designing the shelter, Bell kept in mind simplicity and low cost of construction as well as saving of labor both in care of growing stock and layers. He keeps the cost of construction down to the point where the returns from this enterprise will pay for the building in one year.

Waterproof insulation board is used for the ends, back and lower half of the front. By removing large sheets of this material from each end during the summer, adequate ventilation is provided. Glass substitute which covers the

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front openings in late fall and winter is removed in warm weather.

By using a wire floor, there are no litter costs and very little labor is involved in cleaning. Removing the droppings from underneath the house is easily done once a year before the new crop of pullets is placed in the shelters. The houses, built on skids, are moved with a tractor, the droppings removed, and the houses are then put back in their original locations. During the summer months, the houses are blocked up, permitting air to circulate underneath. When cold weather approaches in the fall, boards are fitted in between the runners to keep out the cold air. Bell says that water has not frozen in these houses, even in sub-zero weather.

The pullets are allowed out of doors soon after they are moved to the shelters and have range until changeable fall weather appears. Then about 175 to 200 are confined to each house.

Egg gathering is simplified by providing a nesting table at the back of the house. Built similar to a dropping board, it is 3 feet wide and 3 feet from the floor. There are no partitions, the pullets making their own nests in 6 inches of shavings.

His records show a high level of production right up to the time they are sold for meat in the winter. This is borne out by the fact that the flock of 1,200 which started laying in May, 1943, produced 13,000 dozens of eggs before he disposed of them. The flock was culled consistently. The bulk of the flock was marketed in January and February even though they were laying well. They were in good flesh, free from pin feathers and averaged about 6½ pounds in weight. In other words, they were excellent meat birds.

Careful feeding to maintain a high intake and skillful management are important factors in keeping them laying well. Bell likes to have them clean up the dry mash every day. When production has reached a peak, he feeds pellets twice daily, in the morning at 10 o'clock and again at two in the afternoon. In addition, he may give them wet mash made by moistening the dry mash in hoppers.

Besides giving them a mixture of other grains, he feeds a liberal amount of oats each day; in fact, he feels that about half of the grain intake is oats. He tried carrying water the first year. This involved too much work, so he now has the water pumped to barrels located in each house.

Lights are started when the days begin to shorten in September. At first he leaves them on two hours in the evening, then he lengthens the time until they

may be left on until 11 o'clock in the evening and started again at five in the morning.

Bell is inclined to favor the plan of getting rid of all of the birds before he starts a new crop of chicks. In addition to the possibility of hitting a favorable market in his area around the holidays, he gets away from the conflict of labor involved in keeping layers at the same time he is starting chicks soon after the first of the year. It is his desire to so reduce and distribute labor that he can do the job with practically no hired labor.

When discussing this type of enterprise with him, he quickly points out that this is strictly a market egg and meat program and he has tried it *only with birds of the heavy breeds*. He is keeping them as layers during that half of the year when the average price of eggs is best. The birds are marketed for meat at the time of year when they are in excellent condition, egg prices have dropped, and the supply of that type of fowl is not likely to be plentiful.

Bell's four years of experience demonstrate again that there is more than one way of developing a profitable poultry business.

Blue Lupine is a Valuable Legume

Condensed from Better Crops with Plant Food

R. Y. Bailey

Chief, Regional Agronomy Division, Soil Conservation Service, Spartanburg, S. C.

From a 2-pound packet in the fall of 1935 to more than 4 million pounds of seed harvested in the spring of 1943 is the remarkable record of blue lupine. This bushy annual promises to be the answer to the search for a winter legume that will produce good crops of seed in the lower South.

Although lupines have been grown in several of the European countries since ancient time, they have only recently come into prominence in the South. Roland McKee of the U. S. Department of Agriculture, sent the 2-pound packet of seed to the North Florida Agricultural Experiment Station at Quincy.

In commenting on the blue lupine planting at Quincy Mr. McKee said: "The testing of lupines that led up to this planting began in connection with our cooperative work with the Florida

Reprinted by permission from Better Crops with Plant Food, Dec., 1944, Washington, D. C.

and Georgia Experiment Stations in 1930 when plantings were made at Gainesville, Florida, and Tifton, Georgia. In 1931 plantings were also made in connection with cooperative work with North Carolina and South Carolina Experiment Stations.

"These tests, together with plantings in subsequent years, indicated the possibilities of lupines in the South and made it clear that special inoculation is required in getting lupines started. The seed sent to Quincy in 1935 was a part of this general program. Special work was also started in 1935 in Louisiana in cooperation with the Louisiana Experiment Station, with very promising results."

Various lupines had been tested at several of the other Southern experiment stations at intervals over a period of 30 or more years. Most of this earlier work was at stations considerably north of Quincy, Florida, and, because of less favorable climatic conditions, results were so disappointing that most agronomists had about written the lupines off as cover crops for the South.

Fortunately, the soil and climatic conditions at Quincy were favorable for blue lupine and it made vigorous early-season growth and produced such heavy yields of seed that it attracted the attention of all who saw it.

From the seed produced at the Quincy Station and distributed for trial plantings, blue lupine rapidly developed into a winter green-manure crop of importance. Farmers in Florida, Georgia, and Alabama harvested between 4 and 5 million pounds of seed in the spring of 1943. This seed had a cash value of more than $325,000.

In addition to its excellent seeding habits, blue lupine grows off more rapidly and is ready to turn under earlier than other winter legumes. When planted by the middle of October, lupine usually makes sufficient growth to turn under so that the crop that follows it can be planted by the middle of March. Green-weight yields of above 10,000 pounds per acre by the middle of February are not unusual. Elijah Cook, a north Florida farmer, had 19,000 pounds of green lupine per acre on February 2, 1943, from a planting made September 1, 1942.

Blue lupine has grown well on most of the soils found in northern Florida and southern Alabama and Georgia. It also has grown well on the light sandy soils in the citrus-producing sections of Florida. When seeded just before irrigation water was applied in citrus groves in the fall, lupine has made excellent early growth and promises to be a valuable orchard cover crop in irrigated orange groves. Like

most other legumes, lupine has grown most satisfactorily on well-drained, fertile soils. In some instances, it has appeared that damping-off of the young plants was more severe on light sandy land than on heavier soils.

Cold damage was more severe in December 1943 on flat than on sloping land. Air drainage probably was a factor in freeze injury on the fields that were low and practically level.

Experience to date indicates that best results may be expected with blue lupine when it is planted early, September 1 to October 15. A few August plantings have been seen where plants survived the high temperatures of late August and early September, but, so far, these earlier plantings have not given as good results as those made from September 15 to October 15. Plants from seedings made in September have sometimes been so far advanced in growth that they were severely damaged by freezes in January or February. Where this has occurred, however, the plants usually have made sufficient growth for a satisfactory green-manure crop. September plantings usually get sufficient rain to bring the plants up before the dry weather that often occurs in October and November.

Farmers sometimes plant blue lupine as late as the first to the middle of December and make moderately good crops of seed. Most of them prefer earlier planting, particularly when the crop is to be turned under as green manure. The young plants from late seedings often are severely damaged by cold, grow on late in the spring, and make smaller yields of seed than those planted earlier.

Blue lupine plants have shown remarkable ability to withstand extended periods of hot, dry weather in the fall. The small plants wilt during the day and look as if they are dead, but revive at night. Survival of plants during the severe drought in October and November 1943 was considerably better than that of Austrian winter peas under similar conditions.

There is considerable difference of opinion about the rate of seeding blue lupine. When planted early, 50 pounds of seed per acre usually gives a fair stand that covers the ground well late in the spring and makes a large crop of seed. Farmers who grow and harvest their own seed often sow 75 to 100 pounds per acre. The heavier rate gives a thicker stand and earlier ground cover. Also, where drought, disease, or worms reduce stands, a thick seeding is more likely to have enough plants survive for a fair stand than will a thin seeding.

Most farmers and agricultural workers who have had experience with blue lupine agree that shal-

low covering of the seed is essential in getting stands. Most experienced growers recommend covering seed from ½ to 1½ inches deep. In connection with depth of covering J. D. Warner says, "Lupine certainly should not be covered more than 2 inches deep and ½ inch seems to be plenty." On light soils in central Florida, covering of 1½ to 2 inches gave better stands in 1943 than shallower covering.

Blue lupine seed has been planted broadcast and with various kinds of drills. Satisfactory stands have resulted from both methods. J. D. Warner followed his grain drill with a cultipacker in 1943 and is sure that stands were improved by cultipacking.

Like other legumes, lupine requires inoculation when grown for the first time. Most farmers inoculated the seed each year with a special lupine culture, even when planting on land where lupine has grown before. The small acre cost of inoculation is considered by most growers to be cheap insurance. A few farmers have planted lupine on land where it has grown before and omitted the inoculation with satisfactory results.

The extent to which the bacteria in commercial inoculant survived several weeks of dry, hot weather when seed was sown in dry soil in the fall of 1943 was a surprise to most who observed it. In several cases, lupine seed sown when peanuts were dug lay in the dry soil 2 to 5 weeks before there was enough rain for germination, but in January 1944 the plants appeared to be fairly well inoculated, except where seed was not well covered.

Fertilizer requirements of blue lupine are, so far as is known, about the same as for vetch and Austrian winter peas. J. D. Warner warns against drilling lupine seed and fertilizer down the same drill spout. He has found that the seed often is injured by direct contact with phosphate. Roots of young seedlings also have been injured by concentration of fertilizer in drill furrows. Warner says, "It is all right to broadcast the seed and phosphate separately and then disk them in together, but there is too much concentration of phosphate on the seed when they are drilled together."

Blue lupine usually matures seed by the first to the middle of May. Yields of seed have varied, but this legume has been a consistent seed producer. Yields of 1,000 to 1,500 pounds of seed per acre are quite common.

Larger yields of seed usually are made on early than on late plantings. J. D. Warner says, "Yields of lupine seed vary with planting dates and weather conditions. My December plantings average 1,000 pounds of seed

while those made the middle of October average 1,300 to 1,400 pounds per acre." Farther north earlier planting is even more important than it is at the Quincy Station.

Most of the lupine seed is harvested with combines. Farmers who grow small patches for seed sometimes harvest by pulling the plants when the seed is ripe and flailing the plants against woven wire stretched over a wagon bed. The seed shatter and fall through the wire into the wagon bed. Lupine seed shatters if not harvested soon after it is ripe. This tendency to shatter limits the acreage that can be harvested with one combine. Farmers who grow large acreages for seed usually plant at several dates, thereby extending the harvesting period for a few days.

Mr. Warner gives a timely warning about the handling of seed after harvesting. He says, "In gathering lupine seed care should be taken to have as few green seed as possible. If there are any green seed when harvested, it is important to spread them not more than 8 to 10 inches deep and stir them every day for 3 or 4 days. Without further stirring seed may be left 10 days or 2 weeks to dry more thoroughly before sacking or placing in large piles. It is important that seed be spread on dry floors that will not "sweat" and keep the seed moist. Where green seed are present, they should not be carried over night in the sacks."

Mr. Warner's warning about drying seed is extremely important. In several cases growers who harvested large quantities failed to spread the seed for drying. When ready to market, germination tests showed the seed to be practically worthless. It is best to play safe and spread seed within a few hours after harvest.

The question often is asked about the northern limits of blue lupine. Although this is not known exactly, experience to date indicates that U. S. Highway 80 in Georgia and Alabama is near the northern limit of its climatic range. So little success has been had with lupine in Mississippi, however, that no statement can be made about its climatic range there.

Lupine seedlings in their earlier stages of growth have suffered varying degrees of damage from disease, particularly damping-off. In most instances the damage has been light enough that sufficient plants for a fair stand survived. Studies of various seed treatments for disease control on lupines are being conducted by the Bureau of Plant Industry, Soils, and Agricultural Engineering, and the Florida and Georgia Agricultural Experiment Stations.

Disease damage does not seem to be intensified where lupine is

planted several successive years on the same land.

There has been considerable damage to stands by rabbits in small seed patches. Rabbits cut the lupine plants off at the ground, eat the stems, and leave the foliage on the ground. Rabbit damage is not important where several acres are planted to lupine.

Blue lupine is classed as a toxic plant, but is not highly palatable and no record is known of livestock being poisoned as a result of eating the green foliage. One case was reported of a goat getting into a barn and eating enough seed from a bag to cause death. Several cases have been observed where cattle grazed the green plants where other green feed was not available. The animals did not show any ill effects from eating the lupine.

Providing some kind of winter cover for land following the harvesting of peanuts is a serious soil conservation problem that has been intensified by the war. Blue lupine that was planted in the fall of 1942 showed much promise as a cover crop for peanut land. It has remarkable ability to grow under the adverse conditions of fall drought and of hogs gleaning the peanuts that remain in the ground when runner peanuts are dug.

Satisfactory stands usually have resulted where lupine seed was sown just ahead of the peanut digging plow in September or early October. Inoculation of plants was sometimes "spotty," where light digging plows failed to cover lupine seed completely. Where the plants got a fair start while peanuts were stacked in the field, the hogs did not destroy the plants when they were turned in to glean the fields after peanuts were picked. If allowed to develop deep roots before hogs are turned in, the lupine plants can take a surprising amount of punishment. Where hogs were turned in soon after planting, severe damage to stands often resulted.

Most of the blue lupine grown in the Southeast has been harvested for seed. Enough of it has been turned under for succeeding crops, however, to show that yields of other crops following lupine compared favorably with those after other winter legumes.

As an example of the yields following lupines, F. P. May, Quincy, Fla., said, "I had a sandy field known as the old Smith field that had been making 5 to 8 bushels of corn per acre. In the fall of 1940, I sowed 40 pounds of lupine seed per acre and turned it under the latter part of the following March and planted corn. In 1941, my corn yield was about 14 bushels per acre. Each fall since then I have sown this field to blue lupine and followed

the lupine with corn. In 1941 my yield was 36, and in 1943, 45 bushels of corn per acre. I did not use any more fertilizer for the corn than I did back in 1940.

The consistently large yields of blue lupine seed have suggested the possibility of industrial uses of the seed in the future. Since the seed of the strain of blue lupine being grown in the South contains a poisonous alkaloid, it has no possibilities as a feed for livestock. There may be other industrial possibilities and it is hoped that these will be investigated.

The recent development of non-alkaloid strains of blue lupine reported in Farmers' Bulletin 1946, Lupines, New Legumes for the South, suggests several possibilities. If alkaloid-free lupines are palatable and have growth and seeding habits comparable to the strain of blue lupine now being grown in the South, they may become important sources of both forage and concentrates for livestock feeding.

It may be well to consider, however, that the development of such strains may have certain disadvantages. Unpalatability of the present strain of blue lupine gives this plant a distinctly practicable advantage as a soil-conserving crop. It makes sufficient growth for early turning under, even when livestock are in the fields during the winter, whereas, the palatable legumes often are grazed so closely that they make little growth before livestock are removed and spring plowing begins. This advantage has been particularly apparent where blue lupine and several other winter legumes and small grains have been planted on different parts of the same fields as ground covers following the harvesting of peanuts.

Blue lupine has been used successfully in conditioning land for pastures in northern Florida. Bermuda grass has grown vigorously following lupine that was harvested for seed. The residue from the combine has furnished both mulch and nitrogen, which benefitted the grass.

Blue lupine has been grown with sufficient success in Florida and southern Georgia and Alabama that it can no longer be considered as a "morning glory." It has a future in this section and promises to be a major contribution to the agriculture of the peanut belt of the deep South.

"2-4-D," the New Weed Killer

Condensed from The Rural New-Yorker

H. B. Tukey

CULTIVATION, rotation, plowing, sanitation, fallowing, hoeing, smothering and many other accepted practices, all have a place in weed control, but more recently the fine results from chemical weed killers have led to a steady increase in their use. One by one, new and improved forms have appeared. Most recently, selective weed killers have been used, that is, materials to kill one plant and not another, as in the case of oil sprays used to destroy weeds in carrots without killing the carrots. And now comes a new approach, the use of small quantities of so-called "growth-regulating substances" to upset the growth of a plant so that it is no longer adapted to its environment or is excited to such activity as to literally grow itself to death.

This new material is one of that group of materials used to prevent the pre-mature dropping of fruits, promote the rooting of cuttings, and set tomatoes in the greenhouse. It is an organic compound, 2-4 dichloro-phenoxyacetic acid, shortened for convenience to "2-4-D." It is relatively easily manufactured, not expensive, and already available in quantity. In many ways, it is as impressive a material for plant treatment as DDT has been for insect control.

Dr. P. W. Zimmerman and Dr. A. E. Hitchcock of the Boyce Thompson Institute for Plant Research at Yonkers, N. Y., have been leaders in the field of growth substances. Not content with the list of chemicals available, they set to work to synthesize new materials and to test their value. One of these was 2-4 dichlorophenoxyacetic acid. It proved the most potent of any growth substance they had found; so potent, in fact, that many who worked with it reported injuries to the plants which were treated.

Earlier than this, Dr. E. J. Kraus of the University of Chicago had suggested that growth substances might be found useful as herbicides by virtue of the twisting and bending and anomalous growth which they sometimes produced. Drs. J. W. Mitchell and C. L. Hamner of the United States Department of Agriculture, working with 2-4-D,

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made the same suggestion in the spring of 1944 from laboratory tests that they had conducted.

The scene shifts next to the Experiment Station at Geneva, N. Y. In a stool block of dwarfing rootstocks, an infestation of bindweed had developed that threatened to ruin the supply of these valuable plants. During the summer of 1944, seeking a solution to the bindweed problem, Dr. Hammer and the writer applied a water spray of 2-4-D at the rate of one to 1,000 from a knap-sack sprayer, using just enough spray to lightly wet the foliage of the bindweed. The response was at once impressive. The bindweed plants took on a dark green color, lay flat to the ground, became stiff, and were arrested in development. Flowers did not open. At the same time, the below-ground parts became enlarged and split. Within 10 days they were dead and disintegrating, and the above-ground parts dried up and died. The bindweed was affected to a depth of 14 inches and suffered a most severe check. The apple rootstocks were apparently not affected.

The material was applied to other plants during July, August and September, also with striking results. For example, sow thistle, narrow-leaved plantain, dandelion, lamb's quarters, round-leaved mallow, chickweed, pigweed, and ragweed were destroyed; purslane, Canada thistle, milkweed, and poison ivy were severely checked. But grasses were in general only slightly if at all affected. The effect on dandelion and narrow-leaved plantain was to produce lengthening and broadening of the base of the leaf until it became ribbon-like, twisted, and whitish. With lamb's quarters, pigweed, and round-leaved mallow, the main stems became bent and split. With sow thistle, the below-ground parts proliferated enormously and literally grew themselves to death. With poison ivy, the formation of chlorophyll was checked, and the plants became chlorotic and weak.

The next step was, quite naturally, the application of 2-4-D to a Kentucky bluegrass lawn infested with dandelion, narrow-leaved plantain, white clover, and round-leaved mallow. Applications were made late in August and September. Within 10 days, the plantain, dandelion and mallow were dead and disintegrating and the white clover was killed back to the main stolons, while the blue grass was darker green in color but not otherwise affected. To test the residual effect of the material in the soil, treated areas were seeded to several cereals and turf materials 5 weeks after treatment. The seed germinated and grew, and the seedlings were apparently not affected.

At the time these tests were being conducted at Geneva, Drs. Paul Marth and J. W. Mitchell of the U. S. Department of Agriculture were carrying on similar tests at Beltsville, Md., and the results from both groups, reported in the December issue of the *Botanical Gazette* are similar, and support each other.

Of course, there is much yet to be learned. How will the treatments at other seasons of the year than mid-summer or fall behave? Will blue grass be killed then? Will affected plants recover? Is there any danger to animals or to health? Will the soil be harmfully affected? Also, how should the material be applied? At what time for best results? At what concentrations?

Much work will undoubtedly be done during the coming season, and specific recommendations and precautions will be forthcoming. At present, the procedure is to use 2-4-D at the rate of one part per thousand of water after first dissolving it in a carrier which is soluble in water. This step is necessary because 2-4-D is for all practical purposes not soluble in water. The carrier used is a polyethylene glycol which goes under the trade name of Carbowax 1500, and which is about the consistency of cold cream at ordinary temperatures. For 25 gallons of spray, 3½ ounces of 2-4-D are dissolved in one pound of warmed and melted Carbowax 1500. The material can be stored in this way for future use. Before mixing with water, it should be warmed and melted. It may be stirred into a gallon or two of water and then mixed with the remainder of the 25 gallons of water, or it may be mixed with the total amount of water at once. If the water is warm, the material handles better and is more effective. Five gallons of spray will treat 1,000 square feet, or 200 gallons for an acre.

Early in July of 1944, the price of a pound of 2-4-D was $125! Quantity production has since brought it within commercial reach. Obviously for small quantities in small packages for lawn application and garden use, the price will be higher than for large commercial use.

At all events, here is one of the new developments which is strictly the outgrowth of scientific research. It is something that will be watched with considerable interest during the months and years ahead, if for no other reason than that it is a new principle in the control of weeds and thereby will attract much thinking and energy to the general problem of weed control.

Stop, Look and Question!

Grace S. Heron

My grandfather was a farmer in eastern Canada. He worked about a hundred acres, which was a big place for those pioneer times, since every acre had first to be cleared of virgin timber. He made a very good business of it. His family lived on the fat of the land—beef and lamb and pork of the best, a hundred turkeys "frozen down" each fall for winter use, a rock-floored cellar full of apples and vegetables, with crocks of sweet yellow butter and preserves filling the shelves. They had a "sugar bush" which furnished them with maple sugar for all purposes, and a Merino flock from which to shear wool and weave cloth for their clothes and blankets—while a flax field yielded, by way of my grandmother's big loom, all the linen needed for bedding and table and ruffled shirt. I have some of those blankets and linens now. And besides his own family, he welcomed and fed all comers along the way, especially itinerant preachers, and he supported two hired men and their abundant children. Incidentally, he tramped through deep snows and sat at their bedside with a rifle across his knees when those hired men suffered the ultimate reward of their fine taste in Canadian whiskey and shouted for the Squire to come and shoot the purple devils on the footboard . . . Incidentally, also, with all the hard work he had to do, he had so high a regard for sightliness and beauty that he kept peacocks to decorate a well-trimmed lawn!

This grandfather was induced in later life to come west on a visit. They showed him the wide stretches of pasture and the huge corn fields and the bursting cribs. He looked a great deal and said little, being a silent man . . . Finally, just before going back to his own weedless fields and carefully pruned orchard and the long low stone house built with his own hands, he delivered himself of one remark: "A very fine country," he said—"but I could make a living from the land you waste!"

In a country as big and varied as the United States, conditions also vary so greatly that one cannot deal with them all in the same terms. Nevertheless it is true that there is land waste everywhere—it is a national issue. In New England, the farms being small and the population heavy, waste is probably reduced to the min-

imum; in the vast areas of the west, it is an economic problem to be approached from what you might call a wholesale angle. But the midwest is the greatest producing area of all, and it is here that the sin of waste is greatest in proportion!

I am farming four hundred acres in one of the best counties in Illinois, with no big towns in it. If you took an air picture of it, you would see just farms, mostly large farms under high cultivation and with no so-called waste land . . . And yet the photograph would show, in detail, one thing to make you stop, look and question! Weeds! Just as rich soil produces rich crops, so also does it produce rank weeds —and the waste is shocking at a time when the world must be fed! Every weed that grows tall and strong along a roadside or fence-line is stealing enough nourishment from the ground to produce a stalk of corn or a dozen spears of wheat . . . In theory the weeds get cut at least three times every year, but it is theory only, for the cutting is a deadlock in most places between owner and township and neither seems to realize its importance. Each uncut weed on the land of a farmer who does not care scatters a million seeds of evil portent onto the land of some neighbor farmer who does care! I should like to print a grist of posters done in flaming colour and distribute them all over the midwest—and the posters would say just this—WEEDS ARE WASTE!

I went to my township commissioner, who is an open-minded man, and asked him if he would allow me to plow and crop the land on either side of the road to within six feet of the road itself. There is twenty-seven feet on each side of the road on which the township has easement; if I took down my fences and plowed twenty-one feet out on each side, it would level off a semi-ditch which now defies a common mower and would control the weeds on that strip at least as well as they are controlled in the fields. The commissioner said yes.

Further, I am removing all unnecessary fencing on my farms and plowing under the weeds that have flourished along those fence lines for years. Of course, on dairy-stock farms, fences cannot all be moved at the same time, but they can be more or less movable . . . Under modern methods, hog-runs and cattle-feeding pens are moved every year anyway. But if the fences cannot be moved—then there is always the scythe!

In my opinion, we are far too tolerant of this most evil of all farming crimes. Let us help ourselves. Weeds, gentlemen, weeds!

Which Farm Lease Shall I Use?

Condensed from Iowa Farm Economist

I. W. Arthur

FOUR main types of farm leases have gradually been developed throughout the years to accommodate the different needs and problems of Iowa farm owners and farm tenants. They are: (1) Straight cash; (2) Flexible cash; (3) Crop share-cash; and (4) Stock share. The different principles employed in each of these leasing plans result in different methods for supplying land, labor, capital and management to the joint farming enterprise and also adopt differing procedures for sharing expenses, risk and income.

Since owners and tenants alike differ in their needs and problems when renting a farm, each person will profit accordingly if he will carefully determine what his needs and problems are.

Some owners view their equity in a farm simply as an investment which will yield them a certain return. They wish to assume as little as possible of the risks of price level changes, bad weather, poor crop yields or farm animal losses. For various reasons they wish to avoid the responsibility of making decisions concerning farm production, operation, management and marketing. Such owners view their land somewhat in the same manner as the owner of a bond or a mortgage and are chiefly interested in a steady cash return from the land. Absentee owners or those not well acquainted with farm operations as well as those who do not have time or capital to contribute to the operation of the farm are examples. Often such owners have fixed obligations or debts on the farm or elsewhere and depend on the income from the farm to carry these obligations.

A second group of landowners desire to assume more of the risks involved in farming—especially risks of changes in the general level of farm prices, but also part of the risk of major crop failures. They do not, however, want to share in the risks involved in the price fluctuations of the specific products sold from their farms.

They still view their farm more as an investment than as a going business. As such they do not wish to provide operating capital or take an active part in the detailed decisions which guide the production and sale of crops and

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livestock. Often such landowners live in another locality. They may have other income sources than the farm and therefore can assume greater risks in farm production and prices.

A third group of farm owners desire to devote more time and effort than the two groups just mentioned to outlining the crop rotation and management followed on their land. While viewing a farm as an investment, they also are interested in actual farming operations, management and crop sales. They are willing to carry some of the risks of varying crop yields and prices, assume some of the costs of crop production and share the responsibilities of management. However, they do not want to share in the ownership, risk or expense associated with the tenant's livestock program. Either they live close to their land—or if they live at a distance, they employ someone to look after the details of their interests.

Then there is a fourth major group of landowners. These owners do not look at a farm just as an investment which gives income in return. Rather they view it as a going business which takes operating capital and sound management to produce and market products. They want to guide and direct the production program followed on their farm. In return they are willing to share farm expenses, risks of changes in crop and livestock production and prices. They depend upon the production of the farm, their capital and managerial ability to produce a satisfactory farm income which will be divided between owner and renter.

Usually farms owned by such men are especially adapted to livestock raising. These owners normally live close to their land, have reserves of cash or credit and often have had a long, successful experience in livestock farming.

Similarly, tenants have different interests and problems to consider as they select a farm lease. First, there is a group of tenants who have sufficient operating capital to enable them to handle crop and livestock operations with their own money or credit. They are usually efficient farmers and therefore prefer not to share the returns from their management ability with the landlord. They definitely want to assume the risks of production and price uncertainty because they depend upon their superior ability to make profits through good and bad times. This means that they want to make their own crop and livestock production decisions. Independent in nature and judgment, they have sufficient reserves to withstand reverses.

A second group of tenants desire to operate on a safer, more

cautious basis. They are willing to pay high rent in good times if they are sure they can get low rent in times of low prices or crop failure. Perhaps they do not have sufficient money or credit in reserve to make them feel justified in assuming all of the risks which go along with a contract to pay straight cash rent. However, they believe themselves to be efficient farmers and want to handle their crop and livestock operations and decisions independently and without landlord interference.

A third group of tenants want to avoid risks of changing crop yields and crop prices just as much as possible. These men own their farm machinery and equipment; it may or may not be clear of obligation. They may be principally grain farmers, or they may also handle some livestock. Often they have little reserve of cash or credit. Although many are good farmers, if not restrained or guided by the landowner some will crop the land too hard—then move to another farm.

A fourth group of tenants want to be livestock farmers but definitely do not want to assume single handed all the risks involved in operating a livestock farm. They usually own a set of farm machinery and equipment. Although they may own some livestock they probably lack the capital to fully stock a good-sized farm. They may have experience in feeding and caring for livestock. They may lack experience, however, in buying and selling and in planning breeding or feeding operations where considerable money is involved and where market timing is important.

Often they are younger farmers who have had some farming experience of their own on smaller farms or have been operating with their parents. They know that at present they lack capital and to some extent the managerial judgment to handle the marketing decisions and risks involved in the kind of a farm business which they want to grow into.

In view of the varying needs of both landlords and tenants, let us see which type of farm lease most nearly meets the requirements of each of the foregoing groups.

These landowners (Group I) who consider their land as an investment and desire to assume a minimum of risk, will be best satisfied with the straight cash lease. This lease will likewise best meet the needs of those tenants (such as Group I discussed in the section on "Tenant Needs") who wish to make their own farming decisions and to assume the risks of farming.

The straight cash lease provides that the tenant pay the

owner a specified amount of money per acre or in total for the use of the land and improvements. It is simple, definite and holds little chance for controversy during the lease year. The landlord has very little part in the decision of farm management, and is freed from the necessity of devoting attention to farming operations. The tenant can handle his livestock as he pleases. While he knows that he assumes most of the risks, he also retains the benefits of his labor and superior management.

In recent years cash rent has not advanced as fast as have farm prices. Many tenants therefore prefer cash rent. When the price level drops, however, this will turn into a disadvantage.

Flexible Cash Lease

Landowners who still view their farms as an investment, rather than a business, but who desire to assume more of the risks of farming (Group II), are in an excellent position to adopt the flexible cash lease. This lease will also appeal to those tenants (Group II) who operate on a bit more cautious basis, but at the same time want to handle their farming operations independently and without landlord interference.

The flexible cash lease provides that the cash rent per acre will vary directly in proportion to the changes in the level of farm product prices in that state or region. In case of a serious crop failure there is a provision for a porportional adjustment in the cash rental due.

Since the rent varies in direct proportion to the prices of agricultural products it is likely to be reasonably fair to both landlord and tenant; the tenant's ability to pay cash rent is usually related to farm prices. There is no necessity to negotiate the amount of cash rent from one year to another. This eliminates the friction caused by bargaining on cash rent every year or two.

Livestock production is encouraged under the flexible cash rent plan more than under the straight cash or grain share lease because rents are in proportion to prices and therefore a renter can afford to feed his grain to livestock without taking all the risk of a drop in livestock prices. It is especially handy for an absentee owner or one who does not want to be continually bothered with making decisions on farm production and marketing operations.

Crop Share-cash

Those landowners (Group III) who desire to devote more time and effort to the management of their land but who do not want to share in the ownership risk or expense associated with the tenant's livestock operations will find the crop share-cash lease adapted to their needs. Similiarly, those

tenants (Group III) who want to avoid risks of changing crop yields and prices as much as possible will find this lease attractive to them. In Iowa it is used more than any other lease.

The crop share-cash lease provides for the owner to receive a share of the crops as his income from the land in grain. He receives a cash payment for the land in pasture and hay. Landowners like this type of lease because it is usually more profitable than a straight cash lease. The owner also has more opportunity to direct cropping programs than under the cash lease.

A tenant finds he has far less personal risk from crop failure and needs less reserves of capital because he has only to meet cash rent for pasture and hay land when he is on the crop share plan. But a certain amount of cash is necessary for this purpose—and this can get out of line in times of falling prices. When prices are rising, on the other hand, cash rent for hay and pasture lags behind the general farm price rise. Tenants also like the added interest the landlord has in the farm.

One of the disadvantages of this type of lease is the year to year bargaining over the price of pasture and hay. Since the grain shares are usually constant, tenant competition comes on the cash rent offered for pasture and hay. Sometimes an undesirable tenant will outbid an honest one on the hay and pasture rent—and then get it back and more too by skimping on the grain shares or by neglecting the land and buildings.

If the tenant buys the owner's share of the grain, there is always the problem of determining the price and the exact time the sale is to be made. Frequently more grain storage space is needed on a farm rented with this type of lease than with the others. And, of course, the farm rented on this basis takes more supervision than one rented for cash.

Stock Share

The livestock share lease best suits the needs of the landowners (Group IV) who look on their farm as a going business in which they want to take an active part in management and assume a share in the risks. That group of tenants (Group IV) who want to be livestock farmers but who definitely do not want to assume single-handed all the risks involved in operating a livestock farm, will likewise find it attractive.

Under the livestock share agreement the tenant usually furnishes all of the labor, equipment, farm machinery and work stock and half of the other livestock. The owner furnishes the land and half of the other livestock. Several variations exist in

the way farm operating expenses are shared. Often it is on a 50-50 basis, with the income then also shared 50-50. The basic assumption in this lease is that the tenant's labor and equipment offset the landowner's contribution of land and buildings. The other contributions are equal and the returns are shared equally.

The tenant finds this lease does not require him to have as much capital as do some of the other leases. There is definitely a sharing of the risks and the managerial decisions upon which a tenant may need help. The young tenant often gets a chance to rent an extra good farm in this way and at the same time gets valuable first-hand experience while operating with an older and successful livestock man.

The landowner is often more willing to improve his farm when he sees that he shares in the benefits. This lease also permits an owner to retain an active interest in the management of the farm and to insure certain farming practices which will keep up the fertility of his farm. Last, but not least, the owner usually gets a higher return from his farm under this arrangement than any other while at the same time maintaining its fertility.

Safe Rabbit Repellent

Of more than 200 materials or mixtures tried as rabbit repellents only one was found to be both effective and safe to use on young trees. The safe mixture is made by dissolving 7 pounds of pulverized rosin in a gallon of ethyl alcohol. Dark-colored, cheap grades of rosin are as satisfactory as any, and anti-freeze grades of alcohol will do if they contain no wood alcohol. The latter will not dissolve rosin.

Best way to dissolve the rosin is to put it and the alcohol into a container with a tight cover to prevent evaporation and permit shaking at occasional intervals during a period of 24 hours or more. The container should be kept in a warm room. No heat should be applied, because it evaporates enough alcohol to alter the composition of the mixture—and it is extremely dangerous. Only what can be applied in the next 2 or 3 days should be made at one mixing. Small quantities should be poured into a can for brush application, and that not used should not be poured back, since it might contaminate the reserve stock and change its nature. Trees turn white with first rain, but the repellent remains effective.

—Capper's Farmer

Spotlight on Vitamin D

Condensed from American Poultry Journal

Ralston R. Hannas

THE value of vitamins in poultry feeding has come more and more to be understood, not only by trained nutritionalists but also by practical poultrymen.

Since the original work by Hart, Steenbock, and Halpin of the University of Wisconsin in connection with discovery and feeding of vitamin D to poultry, great strides have been made along the line. Vitamins A, B, E, and G, together with others not designated by letters, have made their appearance since then and have established their importance in connection with feeding poultry. All the vitamins are important.

Vitamin D is known as the sunshine vitamin because the ultra-violet rays of sun activate a substance in the animal tissues which forms vitamin D; thus the direct rays of the sun are a potent source of vitamin D. Other sources are cod liver oil and certain other fish oils.

Still another source of vitamin D and one that has proved most timely, is that known as "D"-Activated Animal Sterol. Probably few people realize the years of work, research, experimentation, and study that went into the production of this new product which made its debut just about the time shipments of cod liver oil to this country were curtailed by the war. This was a real lifesaver, coming as it did at a time when cod liver oil was less plentiful than it is now.

The story and development of this product is indeed an interesting one. When it is realized that 10 years were required to develop and perfect this product, something of the work and painstaking care in its development can be appreciated.

Another point of interest in connection with the development of this product is the fact that it was done in a commercial laboratory and not by a state university. The biochemists of E. I. du Pont de Nemours and Company carried on extensive investigations, activating suitable sterols with ultra-violet light to produce an effective vitamin D for poultry feed.

Broadly, four stages of research were involved as follows:

First, was the discovery that exposure to ultra-violet rays of

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the sunlight produces vitamin D in the body of young and mature poultry; second, was the observation that this effect could be obtained by exposing to ultra-violet light the feed that animals consume; third, the discovery that certain chemical compounds, known as sterols or pro-vitamins are transformed into vitamin D when irradiated with ultra-violet light; last, the discovery of the difference in vitamin D effectiveness for poultry between irradiated pro-vitamins from animal and plant sources.

The duPont investigations showed that the sterols of animal origin were many times more effective in producing a vitamin D for poultry than were the sterols from plant sources. But this was not all. It was necessary to determine which of the available animal sterols were the most suitable for irradiation, and it was equally necessary to locate these sterols in sufficient quantities to permit economic production.

All this led eventually to the fact that sterols extracted from certain marine animals were found to be most effective, and in addition a method was developed whereby the sterol from certain by-products of the meat packing industry could be converted into satisfactory use.

The result is that sterols are exposed to ultra-violet light under carefully controlled conditions, and the active material is then dispersed in an edible powder carrier that is easily incorporated into commercial feeds. It has exceptional stability and is added to the mash along with the bran or middlings and requires no special equipment for mixing. This source of vitamin D is used by feed manufacturers who incorporate it in the mash; that is how this contribution of chemical science reaches the poultry producer and supplies for his feeds one of the most important ingredients needed for growth, hatchability, egg production, fertility and shell texture.

UREA as a Substitute for Protein

Condensed from American Miller and Processor

T. S. Sutton

Ohio State University and Ohio Agricultural Experiment Station

THE past several years have emphasized the fact that the complex stomach of the ruminant plays an important role in the nutrition of these animals. The original idea regarding the function of the rumen or paunch was that it acted as a storage place for food, permitting the animal to consume relatively large quantities of coarse feeds in a relatively short time.

Of more recent origin is the idea that the rumen functions also as a processing chamber in which a number of reactions of fundamental importance in the nutrition and health of the animal takes place. In the main these reactions are activated by the micro-organisms (bacteria, yeasts, protozoa, etc.) which normally inhabit this portion of the digestive tract.

Some of the important reactions which are brought about by the micro-organisms are:

Synthesis of proteins from simple nitrogen compounds.

Synthesis of vitamins.

Digestion of cellulose.

Gaseous fermentation, which when excessive, results in bloat.

While only the first two of these are to be discussed here, the others are mentioned because it appears that all of these reactions are going on simultaneously. Furthermore, anyone or all of these reactions may be altered by the nature of the feeds consumed.

Urea is a relatively simple nitrogen-containing organic compound. It has the historic importance of being the first organic compound synthesized in the chemical laboratory. Urea was discovered in the year 1773 as a component of urine, in which about 70 to 90% of the nitrogen occurs in this form. It was synthesized in the chemical laboratory of Wohler in 1828.

Pure urea has the formula $CO(NH_2)_2$ and contains 46.65% nitrogen. It is a white, crystalline, water soluble compound which is tasteless and odorless. It is produced synthetically from ammonia and carbon dioxide. Pure urea (46% nitrogen) cakes badly. (A commercial product con-

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ditioned to prevent caking is now available. It contains 42% nitrogen.)

Average protein contains 16% nitrogen: (100÷16=6.25) — therefore in protein determination the percentage of nitrogen is multiplied by 6.25 to get the percentage of protein. Using these same calculations a 100-lb. bag of feeding urea containing 42% nitrogen would be equivalent to 262.5 lb. of protein.

Micro-organisms, particularly bacteria, can utilize simple forms of nitrogen to form protein for their growth. This is well illustrated by the soil bacteria of legume root nodules which use nitrogen of the simplest form (nitrogen of the air) converting it into a form which becomes available to plants.

When urea is consumed by ruminants, it is rapidly broken down liberating the nitrogen in the form of ammonia. The rumen bacteria use this ammonia nitrogen to build their body proteins. These bacteria pass down the digestive tract and are digested by the animal.

Thus the nitrogen of the urea is first used to build the body proteins of bacteria which is later digested and used by the animal. Obviously the factors which influence the bacterial utilization of urea in the rumen will determine the effectiveness of protein replacement. It is also obvious that urea or other simple nitrogenous compounds can be used as a protein substitute only in the ration of ruminants (cattle, sheep and goats).

Urea has no feeding value in the case of animals with simple stomachs, swine for example.

Experimental work in which urea was used as a substitute for part of the protein in ruminant rations has been conducted at experiment stations in Wisconsin, Illinois, Massachusetts, Hawaii and New York. In each instance it was found that the nitrogen supplied by the urea was utilized by the animals. Experimental conditions varied somewhat and some variation in the efficiency of utilization of urea nitrogen occurred.

The best results have been obtained with dairy cattle. Results with fattening steers and lambs have been less satisfactory although a certain amount of urea can be converted to protein in these animals.

For greatest replacement value urea should be used in dairy feeds that have a low true protein content. Apparently true protein is used for bacterial growth in preference to urea in rations containing abundant true protein.

Urea is efficiently utilized only in rations containing an abundant supply of easily fermentable carbohydrate such as starch or

sugar. There is no advantage of molasses over some starchy material, such as corn, in this respect. Feed mixtures which contain corn, wheat, barley or other cereal grains satisfy this carbohydrate requirement.

Urea should constitute not more than 3% of the concentrate mixture or about 1% of the dry matter of the entire ration. If too much urea is fed it may not only be of no value to the animal but it may be harmful by causing injury to the kidneys. Resolution 20 of the Association of American Feed Control Officials, Inc., limits the combined urea and ammonical nitrogen in proprietary feeds to a protein equivalent no greater than one-third of the total crude protein nitrogen.

Urea should not be mixed with feeds containing raw soybeans or unheated soybean meals. Raw soybeans contain an enzyme (urease) which acts upon urea to liberate free ammonia. The ammonia thus liberated is rapidly lost in the air. Heating destroys this enzyme, therefore there is no enzyme activity in toasted solvent extracted soybean meal.

There is usually enough heat generated in the expeller process to destroy the enzyme but in the hydraulic process insufficient heat may be applied to destroy all the urease activity. Loss of nitrogen is certain in stored feeds containing urea and raw ground soybeans or soybean meals that have been inadequately heated.

Experiments with dairy cattle in which urea was used as a substitute for protein in the milking ration have been conducted at experiment stations in Wisconsin and Massachusetts. In the Wisconsin experiment which covered a three-year period, 24 Holstein cows were divided into four comparable groups of six cows each.

Three of the groups received in succession the basal ration, the basal ration plus urea, and the basal ration plus linseed meal. To compensate for age differences the order of the ration changes varied with each group. The fourth group was used to study the effect of corn molasses upon urea utilization. The rations used were constituted as follows:

	Basal	Urea	Linseed Meal	Urea-Molasses
Ground Yellow Corn	49.0	47.5	32.0	47.5
Ground Oats	49.0	47.5	32.0	47.5
Urea	...	3.0	...	3.0
Linseed Meal	...	...	34.0	...
Bone Meal	1.0	1.0	...	1.0
Iodized Salt	1.0	1.0	1.0	1.0
Ground Limestone	...	...	1.0	...
Corn Molasses	...	...	...	10.0

SUMMARY OF RESULTS

	Basal	Linseed Meal	Urea
Cows Fed	15.	15.	15.
Days in Period	256.	267.	268.
Weight, lb.:			
Initial	1105.	1072.	1083.
Final	1130.	1184.	1185.
Gain	25.	112.	102.
Daily Feed, lb.:			
Concentrates	9.71	10.42	10.22
Corn Silage	34.33	35.18	35.04
Timothy Hay	9.20	9.31	9.35
Total 4% Milk, lb.	6675.	7790.	7690.
Daily 4% Milk, lb.	26.07	29.18	28.69
Total 4% Milk adjusted for age and estimated portion of first lactation, lb.	7855.	9355.	8988.

Note that the basal ration gave significantly poorer results than the linseed meal or urea rations. The difference in performance on the urea and linseed meal rations was not statistically significant. An interesting computation of the results obtained was to standardize the adjusted yields to a basis of 3.4% milk. This more nearly approaches the actual kind of milk produced. When this was done the following averages were obtained:

Basal ration, 270-day lactation, 8639 lb. milk; linseed meal ration, 285-day lactation, 10,280 lb. milk; urea ration, 283-day lactation, 9877 lb. milk. The molasses group produced evidence that for animals of this age a ration containing cereal grains is not improved, as far as urea utilization is concerned, by the addition of sugar in this form.

Studies on the composition of milk produced by the cows on this experiment showed no significant difference in fat content, taste, or the amount of vitamin A, carotene, riboflavin, ascorbic acid or pantothenic acid.

There was no difference between ration groups in breeding history, reproduction or weight of calves. The authors conclude: "It appears that with this species and a suitable ration in respect to carbohydrate content, urea can function as a source of nitrogen as effectively as can oil meal."

The Massachusetts work produced results that were not quite as favorable. However, the research workers conclude that with due consideration of the limitations, urea will find a place in the feed trade.

Fiber and Bulk in Poultry Rations

Condensed from American Feed Trade

G. F. Heuser

Cornell University

Besides the actual composition of the ration there are other factors which must be considered in making rations. Digestibility of the nutrients is one factor. In the case of poultry, fiber is more important than in the case of other farm animals because of the non-availability of fiber to fowls. Fiber contributes little, if any, digestible nutrient and also makes other nutrients less available. Food intake is also important. This is influenced in part by such mechanical consideration as palatability and bulk or volume of the ration in relation to the nutrients supplied.

In experiments at Cornell, rations similar except for the inclusion of fibrous feeds have been fed to chicks and hens with an apparent effect of digestibility upon growth, weight-maintenance and egg production.

In four different chick experiments, involving 25 paired lots, growth was always greater when corn replaced wheat bran or ground oats, when crushed wheat replaced bran and middlings, when crushed wheat and ground rolled oats replaced wheat bran and middlings and pulverized oats.

In the hen experiments, involving 5 paired lots, the egg production was higher and the body weight maintained better when crushed wheat replaced wheat bran and middlings.

It is concluded that rations containing feed ingredients of a fibrous nature such as oats and wheat by-products were less efficient for growth, egg production and maintenance of body weight than feeds of a less fibrous nature such as whole wheat, corn and rolled oats. The rations must otherwise be complete in all respects with the replaced ingredients not adding any necessary factor or the results might be masked. The greater efficiency of the less fibrous rations is probably due to a greater amount of digestible nutrients being made available and an increase in caloric intake.

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How to Start a Car in Cold Weather

Condensed from The Dakota Farmer

One of the car problems which has never been entirely solved is just how to start a car on a cold morning. In the old days, a jacked-up hind wheel and a teakettle of hot water was a great help on a frosty morning. With modern cars that doesn't work so well, so we have to look to better methods. If a car has winter oil, the ignition system has been checked and adjusted for winter driving, and the carburetor and choke are working right, then your car should start—if you follow these suggestions:

1. Open the throttle about one-quarter way with the hand throttle and leave in this position until engine is started.

2. Push the accelerator pedal to the floor two or three times. This action will reset the automatic choke and fast idle, when carburetors have these features. In addition this "pumping" of the accelerator pedal will "prime" the manifold with some gasoline from the carburetor.

3. Push the clutch pedal to the floor and hold it there.

4. Pull out the choke full distance. (This is done automatically on cars with automatic choke.)

5. Turn on the ignition key and step on starter. Push choke button in slightly after engine has turned over once or twice.

6. After engine is running, release the clutch pedal and permit the engine to warm-up for three to five minutes without racing it. As the engine warms up, push in the choke button to produce smooth running of the engine.

If starting is difficult, other adjustments may be necessary. The distributor breaker points may not be adjusted right, there may be cracks in the distributor cap, wires may be loose, or there may be broken or damaged insulation on spark plug wires.

If everything else fails, there are still ways of getting a car started. A very strange thing about a stubborn car is that it may start if it gets pushed or pulled. If the tractor will start, or if you have a team in the barn, the pulling problem is solved—providing you can get some one to help you. If you park your car on a hill you can let gravity push you down the hill.

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Need of Efficiency

Condensed from The Shorthorn World

Harry H. Smith
Colorado State College of Agriculture

IMPROVEMENT of livestock on the farms and ranches is not just a wartime practice which can or will be dropped when the peace is won. Livestock improvement is older than written history.

More than half of the agricultural income in the United States is from livestock and in the farm income, cattle play a very important part. How important a part they play depends on the quality and how efficiently they are handled. Your feed lot and your farm is a factory, a factory for producing food. If the livestock on your farm are maintained at a high standard and are handled efficiently, they will do their part.

When one has an opportunity to visit hundreds of ranches and farms each year and observe the cattle and how they are kept, particularly the kind of bulls used, one begins to wonder whether or not some breeders really know the meaning of the word "efficiency." Grass is the main crop on most of the land in our western range states and it is an important crop on many of the farms of the corn belt and eastern states. There is no way to utilize this grass except to feed it to livestock. The better the cattle are which are grazed on it the more efficiently it is used. The statement is often made that it costs no more to feed and market a good animal than it does a poor animal but there is a lot of difference in the size of the check when they are sent to market.

In a September 25th government market report choice fat steers from 700 to 900 pounds were quoted at Chicago at $16.75 to $17.75. Good cattle, 700 to 900, at $14.00 to $16.00, medium, 700 to 1100, at $11.00 to $14.75 and common, 700 to 1100, $9.50 to $11.50. In other words, on the average a grade makes about $2.00 difference in the value of the animal or $20.00 per head on a 1000 pound fat steer. Did the feeder make the difference when he bought the feeders? He certainly did. Not long ago a feeder showed me two bunches of yearling feeders he had purchased and made the statement that the

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two lots of steers were bought from two breeders and represented the offspring of two different bulls. He paid $15.00 per head more for one bunch than he did for the other bunch and they were well worth it. You say he will make as much money off the poor quality steers as off the good ones? Maybe he will. He paid $15.00 less for them. It is the fellow who produced them who suffers. In one case one man has followed the practice over the years of using good bulls. The other fellow used any bovine males that were handy. They didn't cost much? Well, they *were* more expensive *than the* good ones, because they returned less profit to their owner. The poor bull is the kind one never gets through paying for. As long as he or any of the offspring are in the herd his influence for bad will be felt.

The bull is more important in herd improvement than any other single factor. You can't build up a good herd, grade or purebred, unless the bull is better than the cows in the herd.

What is a good bull? Any practical cattleman who has made a success of breeding knows what a good bull is or else he would not have been successful. By successful, we at once think of a man who has good cattle and is gradually making them better each year. He will describe a good bull as one which is deep bodied, thick, low set, having straight legs with plenty of bone of good quality, one which is short from the shoulder to the hip bone, but long from the hip to pin bone, full and thick in the round and thickly and evenly fleshed all over. The good bull will have a head which is short, wide between the eyes, strong in the muzzle, a head which is masculine having the appearance of strength. He also must have size. You sell pounds when you go to market, but extreme size is not desirable. Usually the medium size is more in favor. What is a good bull? One which would have made a top steer. If he would not have made a top steer, don't use him no matter what you can buy him for.

A bull must be better than the cows which he is to be used on or there can be no improvement, but if he is better than the cows and the best heifers are saved and put back into the herd, that herd will gradually improve. If the bull calf is sour headed, shallow bodied and leggy, castrate him and send him to market. Selling this kind to the commercial breeder is a mistake and makes no friends for the purebred breeder and wins no friends for the breed. Purebred scrubs have done our commercial cattle industry more harm than any other one thing.

If you want to improve your

herd, don't expect the bull to do all of it. The cow needs attention too. Cull the cow herd carefully each year, take out the cows which are nearing the end of their usefulness and any which are shy breeders and any which failed to produce enough milk to properly raise their calves. This failure should be unforgivable. Also cull the cow which produced a poor calf. Hold back the best heifer calves for replacement. They will need to be culled again as yearlings or two year olds. Some of them will not develop as they were expected to.

Breeding the best to the best is responsible for practically all the improvement in our farm animals, from their wild state to their present high standard.

The summer feeding of the breeding herd is no problem if there is a good supply of good grass. This is nature's perfect feed and leaves nothing to be desired. The winter feeding of the breeding herd is something else. In winter the herd must be fed on stored feeds which usually are more costly than the summer feed of grass. For this reason economy must be the watch word. That does not mean that the owner can take a niggardly attitude toward the feeding of his herd. No one ever starved a profit out of livestock. Such cheap feeds as straw and corn stover can be used to advantage for part of the ration if some protein feed is fed along with them. Some silage also adds variety to the winter ration. Also where the roughages used are carbohydrates and the protein supplement is one of the protein concentrates, some mineral mixture high in calcium should be offered. Ground up limestone 2 parts and salt one part will suffice. If phosphorus is lacking, then a mixture of equal parts of ground up limestone, bone meal and salt will be a good mineral supplement. If good alfalfa or clover hay is fed as the protein supplement, the mineral is not so important though it is not a bad idea to have some available so they can eat it if they want it. About 4 pounds of alfalfa hay will furnish as much protein as 1 pound of cottonseed cake.

Generally it is poor economy to feed grain to the breeding herd, though it will generally pay to feed some to the calves to keep them growing normally. Through the winter a calf should gain .75 to 1 pound per day. This gain will be growth and even when making this gain they will lose fat.

The purebred breeder knows the importance of feeding some grain to his calves during the winter in order to develop them properly. The choicest roughage should go to the calves and the young stock.

Rye Pasture for Pigs

Condensed from The Berkshire News

J. L. Krider
University of Illinois

MOST swine producers are aware of the merits of pastures in an efficient pork production program. Legume pastures and various pasture mixtures are used for late spring and summer feeding on most farms, and these provide forage from late April or early May until late September or early October.

Fall seeded rye pasture has been used at the University of Illinois Swine Farm to study the possibility and advisability of increasing the length of the pasture season, especially in early spring for sows and litters, as early as March 1. This would extend the season 6 to 8 weeks earlier into the spring, and give the pigs a real start so they would be able to make maximum use of legume pastures the remainder of the season. Rye has also been used to extend the pasture season into late fall and even into the winter months with considerable success.

Rye pasture for sows and their litters does stimulate growth in the pigs and saves concentrates. When rye pasture was compared to dry lot, the pigs on rye pasture averaged 32 pounds at weaning time as compared to 27 pounds for the dry lot pigs. The 5 pounds increase in weight per pig was significant contribution of the rye pasture which was obtained with a slight gain in weight (7 pounds) on the sows that grazed the rye, while the dry lot sows lost 38 pounds per head. To give an over all picture of gains, by taking into consideration the gain or loss in weight of the sows as well as the gains of the pigs, the net weight increase per sow and litter on rye pasture was 79 pounds more than the net weight increase per sow and litter in dry lot. On pasture the death losses were lighter than in dry lot.

Fall-seeded rye pasture becomes a very valuable crop on the basis of the amount of corn and protein supplement saved for these sows and litters. One acre of rye saved almost 100 bushels of corn and 560 pounds of protein supplement. These "feed-saving credits" were obtained by graz-

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ing twelve sows and their litters per acre of rye pasture. As a matter of fact, additional sows and litters were grazed on the rye after the experiments. At present feed prices (corn $1.14 per bu., and protein supplement, $70 per ton), one acre of good rye pasture would be worth approximately $133 when grazed by sows and litters. In addition to this direct measurement, we now know from recent experimental data that there is an important "carry-over" effect of rye pasture into the weaning to market period. This "carry-over" enables the pigs to grow when fed concentrate mixtures in dry lot which fail to produce satisfactory results when fed in dry lot to pigs reared before weaning without pasture. Apparently the pig stores certain factors in his tissues while grazing the rye, which may be used later when needed to grow satisfactorily. This effect could be demonstrated with any good pasture and is not particular to rye. We have called this the "residual effect" of the pasture.

When weanling pigs were self-fed yellow corn, soybean meal and minerals free-choice on rye pasture, growth was as satisfactory as when the supplement was tankage two parts and soybean meal one part. Without pasture, failure would result on such a ration if it were fed to weanling pigs.

It is possible under certain conditions to formulate a ration adequate to vitamins and minerals, using a plant protein like soybean meal as the only protein supplement. The rye pasture is a very economical vitamin supplement for early spring pigs that are farrowed in February and early March. Often troubles are encountered in early farrowed spring pigs because of the difficulty in providing an adequate ration in dry lot. Pasture is not the answer in all cases, but it will aid materially in supplementing a ration composed of cereals, minerals, and the more commonly used protein supplements.

A few years ago Dr. Carroll and Dr. Burroughs used some 44-pound fall pigs to study the value of fall-seeded rye pasture for growing-fattening pigs during the winter. The experiment was unique in that it was designed to measure the value of the rye in two ways: (1) in terms of increased pork production and (2) in terms of feed saved in producing a unit of gain. In order to measure the increased pork produced by the rye pasture, the same amount of concentrates was fed to the pasture lot as was consumed by a similar group of pigs in dry lot. When the pasture group averaged 200 pounds in weight, the dry lot pigs averaged 183 pounds. With 10 pigs per acre of rye, the pasture could

be credited with 170 pounds of pork. When another group of pigs was fed on rye pasture to gain at the same rate as the dry lot group, the pigs required 42 pounds less feed to produce 100 pounds of gain. In both cases the rye had a measurable effect. The winter was an unusually severe one and the pigs often had to root in the snow to get the rye. During a less severe winter the fall-seeded rye pasture might be expected to show up more favorably.

When an acre of rye pasture was grazed by bred gilts during gestation from late October to early March in contrast to dry lot, about 300 pounds of concentrate mixture and 575 pounds of alfalfa hay were saved. Each dry lot sow ate about one-half pound more of grain mixture and 0.9 pound of alfalfa hay daily to produce the same gain as the sows on rye pasture made. There were no significant differences in the farrowing records of the pasture and dry lot groups.

With a little planning the area needed for winter rye pasture for hogs need not be withdrawn from the regular crop rotation. When sows are bred for early spring litters, they can be removed from the rye pasture early enough in the spring to permit the land to be prepared for corn or soybeans. Such a plan could include an area for grazing the sows during gestation with an adjoining area of clean rye for farrowing and subsequent grazing of the sows and litters during lactation. Sows bred for late February or early March litters make maximum use of rye pasture and the pigs are then ready to make maximum use of legume pastures throughout the summer. Such a program would yield heavier and more pigs at weaning time or less grain and protein supplement than dry lot feeding. It would also fit into a swine sanitation program to provide healthy pigs for the subsequent fattening on pasture or in dry lot, and to produce thrifty growthy breeding stock for replacements.

New Land Clearing Machine

Condensed from The Farmer

ALREADY past its first successful tests a new land clearing machine developed under the sponsorship of the Office of Iron Range Resources and Rehabilitation, Hibbing, Minn., promises to make land clearing faster, cheaper and more satisfactory for farming operations which follow than old land clearing machines and methods.

The machine has the appearance of a massively built snowplow, is mounted on the front of a crawler type tractor and is controlled by cables that permit the operator to lift it up for getting over large stones and stumps. Its spread at the back is 12 feet and the running edges on either side of the "V" are 15 feet long. The cutting action is achieved by saw tooth blades a foot long and extending seven inches out from the running edges. A steel framework protects tractor and driver from falling trees.

As the machine is pushed forward it takes brush, saplings and even trees up to two feet in diameter. One thing about the machine which surprised and impressed observers during the trials was that it took off the trees at the surface of the ground, and the final break of every stump was clean, pulling out the slivers rather than leaving them sticking up to be cut out later by hand. Nor did the machine pile up dirt with the brush and trees. In fact, the leaf mold was scarcely disturbed except where tops of hummocks were sheared off. When the brush and trees are cleared off by burning or hauled away for sale the land is in excellent condition for pasture seeding.

Although no record of operating costs has been compiled over enough jobs to cover varying conditions it appears that the machine may be operated for about $8 an hour and unless the clearing is on land where the wood yield is in excess of 25 cords an acre, it can brush off an acre an hour.

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Prevent Cannibalism with Cow Manure

Condensed from Successful Farming

Remarkable results in curing cannibalism among laying pullets thru daily feeding of fresh cow manure have been obtained at the University of Wisconsin. While this is not recommended as the complete answer and should be supplemented thru feeding greens and salt, evidence so far, both experimental and from experiences of farm people, certainly puts this method in the "worth trying" class.

Do not feed too much cow manure the first few days, caution the Wisconsin poultry scientists, because the birds are so greedy that they may consume too much manure and too little laying mash, with resultant decline in egg production. After they become accustomed to manure, the poultry raiser may give them all they want, and usually one cow will produce enough for 250 hens.

There's no need to fear that chickens will pick up diseases from eating cow manure because they are not susceptible to the same ailments that affect cattle. However, it is well to feed the manure in troughs equipped with reels.

Altho impossible to explain definitely why this method helps prevent cannibalism, it is known that cow manure contains certain nutritive factors, including B-complex vitamins, which frequently are deficient in the regular feed.

One essential in preventing prolapse, and resulting cannibalism, is green grass, or a substitute such as leafy alfalfa hay in racks, good quality grass silage or corn silage, cabbage, and chard. It seems desirable to feed some of these in addition to alfalfa during the first few weeks that the pullets are confined to the laying house.

Cannibalism frequently can be overcome thru feeding of extra salt, and the mash needs to carry 2 percent salt where the pullets consume twice as much grain as mash. The Wisconsin "salt-water cure," using 1 tablespoonful of salt in each gallon of drinking water from the time pullets leave the roosts until noon for three or four successive days, also has served well as an emergency measure.

All fresh water should be removed during the forenoon because otherwise the chickens would not touch the salt water. Give fresh water in the afternoon, as the flock will grow too thirsty if forced to drink salt water all day.

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Breeding for Efficient Gains

Condensed from American Hampshire Herdsman

As a result of breeding for fast and efficient gains at the Alabama Agricultural Experiment Station, the feed requirement for a unit of gain has been reduced with each succeeding generation.

This Alabama experiment has been running for 7 years. Upon completion of each year's feeding trials, the 4 or 5 boars and 10 or 12 gilts that reached 225 pounds on the least feed were selected as breeding animals. These, together with a few old boars and sows whose progeny have proved to be efficient users of feed, served as the parent stock for the next generation.

Feed required for each 100 pounds of gain in the first-generation pigs was 386 pounds; whereas the sixth generation required 334 pounds as an average.

Writing of the experiment, J. C. Grimes, head of the Animal Industry Group at the Alabama Station, continues: "Although pigs within the same litter frequently vary considerably in efficiency of gain, pigs from certain families or bloodlines consistently have made faster and cheaper gains than pigs from others. The ability to consume feed and convert it into fat and meat rapidly and efficiently appears to run in families.

"Type was not considered in our selection of breeding animals; selection was made entirely on feed requirements per unit of gain. Nevertheless, the fastest and most economical gains were made by animals of medium type —hogs with broad, deep and medium long bodies. Slow and expensive gains, on the other hand, are associated with very chuffy hogs, or hogs that are long, narrow and shallow of body and that have long legs.

"The chuffy-type hog appears to gain economically up to a certain point, after which gains are slow and expensive. This type of hog is finished at 150 to 160 pounds, which is too light to bring top market price and which cannot be carried economically to heavier weights.

"In this experiment there was also a direct relationship between the weight of a pig at birth and weight at weaning age, and the rate and economy of gain. Size of a pig at birth also had a great deal to do with his chance to live."

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Earthworm Culture

Dr. Thomas J. Barrett

THERE is nothing new about the knowledge that earthworms are essential to agriculture. Aristotle 2000 years ago called them "the intestines of the earth." Gilbert White, noted English naturalist of the 17th century, wrote: "Without earthworms, the earth would soon become cold, hard-bound, sterile." Darwin wrote a whole book about the work and the habits of earthworms, and, contemplating the green fields of England which throve on the chemistry of these blind wigglers, commented: "It may be doubted if there are any other animals which have played so important a part in the history of the world."

The noted Harvard geologist, Nathaniel S. Shaler, aptly called the earth's thin layer of humus-bearing topsoil: "the placenta of life"—and humus is virtually a copyrighted product of the earthworm.

Most farmers realize that the earthworms are "helpful." They attribute this to the fact that worms aerate the soil, make it more porous and absorbent. They seldom understand that this is only a minor function of earthworms, and that while they are making mechanical scratches in the surface of their fields with horse-drawn plow or with tractor, below the surface millions of scientists are at work, converting organic and mineral raw materials into rich food on which plant life feeds richly.

What is new about earthworm culture is the idea of mass-producing them so that they can be "planted" where their admittedly "magic qualities" can make poor soil fertile and good soil prolific.

As in so many "new" discoveries, only the idea was new. It all started when, as a combat runner in 1918, I was coming back from the front line and saw an ancient French peasant sweeping the earth beside a stone wall. I asked him why he was doing that. With many gestures, he replied:

"Le Bon Dieu knows how to make the good earth and he has given his secret to the earthworms. They work in great numbers, and it is the finest earth there is. I take it home for my choicest flowers."

Nearly twenty years later, hoping to make *something* grow in my semi-desert property in the San Fernando Valley at Roscoe, California, I turned a shovelful of earth at the base of a cactus

plant. An earthworm came up with the dry-as-dust earth. It was pale, anaemic, but still wiggling, still trying "to make the good earth."

That worm started me thinking —and acting. Today the sparse and puny homesite at Roscoe has become a place of tropical luxuriance of flowers, shrubs and ornamentals, green lawns, berries, grapes, figs, plums, peaches, apricots and olives.

And all because a few million earthworms helped me.

I quickly discovered that, instead of one overworked earthworm to a spadeful of soil, hundreds and thousands would grow and go to work if they liked the food and moisture conditions. So I started an "earthworm research farm" in a wood box—and literally transplanted from that box the garden spot which replaced the desert.

I could have ignored earthworms, of course, except as fish-bait, and waited. Nature might eventually have laid down topsoil at the standard rate of 1000 years to an inch.

And in a few thousand years Roscoe would have been ready for planting. But I preferred quicker action, and found it in earthworms. I found out that in the chemical and mechanical laboratory which is an earthworm's insides are combined all the processes of quick topsoil building.

The earthworm swallows great quantities of earth, with all that it contains in the way of minerals, vegetable remains and animal residue, bacteria and the microscopic life of the soil. In a powerful mill—the worm's gizzard—using grains of sand for millstones, these materials are ground and mixed, and abundant secretions are poured in to exert solvent and chemical actions.

In its journey through the worm's long stomach, animal hormones are added. Finally, it is ejected inside the earth and on the surface in the form of familiar "worm castings," a crumbly, finely-conditioned topsoil, richly endowed with all the elements of plant nutrition in water-soluble form — the form in which it is "edible" to plants.

Some idea of the concentration of earthworms in soil containing sufficient nourishment for them to thrive may be gained from official statistics: "If your soil is suitable," says Prof. S. O. Heilberg, New York State College of Forestry, "there may be more than two and a half millions per acre, weighing 1400 pounds. That means more pounds of earthworms in your employment than all domestic animals put together." Another estimate placed the total weight of earthworms in the United States at more than ten times that of the human population.

Some idea of the production of fertile soil by two and a half million earthworms to the acre may be gained from the fact that in England, where concentrations range from 25,000 to 50,000 worms an acre, some ten tons of humus are estimated to be produced on each acre by earthworms.

Corroborative of my own experience of "desert into garden" are other experiments. One test, using boxes of soil containing earthworms compared with wormless boxes, showed the following percentages in favor of the former: Rye, 64 per cent; potatoes, 136 per cent; vetch, 140 per cent; peas 300 per cent; rape seed, 733 per cent.

A California experimenter planted three boxes of lawn grass. One contained good native soil and no earthworms; the second contained the same soil, with worms living and working in it; the third was of pure earthworm castings. After sixty days growth, the grass was cut. The box with native soil and earthworms yielded 271 per cent more than the wormless earth, but the crop of the box containing the worm-cast soil was 463 per cent higher.

Granted that the evidence in favor of earthworms as the farmer's best friends are overwhelming—how can the worm be "harnessed?" That knowledge is the stock-in-trade of this newest of all industries. And it is simplicity itself. All that is needed is $5 to $25 in cash, a hammer, saw, nails, a few pieces of lumber and a few old boxes. Earthworms or earthworm eggs, the latter worth $10 per 1000, planted in moist earth mixed with earthworm food, yield a rich harvest at regular 21-day intervals. The eggs, even the worms themselves, can be shipped parcel post to customers who need to enrich their soil with these "squirming scientists."

And what is earthworm food? Just about anything for which there is no other use—garbage, tea and coffee grounds, vegetable peelings, manure.

On such things earthworms grow and multiply by the thousand-fold. It is a fascinating and profitable business and hobby.

Pasture with a Punch

Condensed from Capper's Farmer

George A. Montgomery

SEVERAL million acres in the richest farming sections of the Middle West are doing half a job or less, while other acres of the same farms are producing 15 to 25 per cent more than could have been expected from them a few years ago. The loafing acres are in permanent pastures; those carrying the extra load are in hybrid corn, improved varieties of soybeans, rust-resistant oats, higher yielding new wheats. Those slacker pasture acres are just as guilty of reducing war production as any striking workers who walk out of a factory. They are on a slow-down strike that lasts from the time grass greens in spring until it is nipped by frost in fall.

Weedy, overgrazed bluegrass pastures no longer belong on a modern farm; it is time to replace them with pasture forage good enough to take its place across the fence from hybrid corn and other improved crops. The change to more productive pastures is the next big forward step in farming. It is important now because the country needs all the meat and milk that can be produced; it will be a necessity in the postwar period to give a decent return on land if farmers again are forced to cut grain acreage.

Agricultural experiment stations have been testing new combinations of grasses. Several have found brome and alfalfa their best all-around pasture mixture. In a 3-year test, the Indiana station found 1 acre of brome-alfalfa produced 10 per cent more milk than 2 acres of bluegrass, even when cows on the bluegrass ate 3.7 per cent more grain. Wisconsin announced its findings in an annual report under the heading: "The New Champion—Brome-grass-Alfalfa Mixture." Bluegrass in the first 3 years of the Wisconsin test averaged 2,762 pounds of forage, dry basis, an acre annually; brome-alfalfa, 7,837 pounds. Thus, it would take nearly 3 acres of bluegrass to be worth 1 acre of the mixture.

Illinois compared the meat-making capacity of the 2 pastures. In 3 years, 1938 to 1940, yearling beef cattle averaged 153 pounds of gain an acre annually on bluegrass, while brome-alfalfa over the same period produced 259 pounds, or 70 per cent more. These 3 tests give a fairly ac-

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curate idea of the comparative values of these pastures. It should be remembered that the bluegrass used in these tests had been managed properly, and supplied 2 to 3 times as much feed as those pastures that are weedy and unproductive because of overgrazing.

Before Fred S. Dunks began to use brome-alfalfa mixture, his Jersey herd in Branch county, Michigan, strung along in the 350-pound class. Since he got enough of it to see him thru the pasture season, annual averages have ranged from 408 to 435 pounds. When the herd continued to produce 75 pounds of fat a cow more than formerly, he recalled September slumps he once dreaded, and sat down with the cow tester's books and a pencil. How much had leveling those dips done to bring up the yearly average? He found the late summer slump wasn't a 30-day affair. It started in July, got worse in August, reached its cimax in September. Most of the 75-pound annual jump after he changed to brome-alfalfa was from more milk in those 3 months. His herd, with more than 40 in milk all the time, could have been in the 425-pound class all along if the cows had grazed succulent, high-protein pasture from July 1 to October 1! Dunks formerly had relied on bluegrass, timothy, red clover and alsike. These grasses gave him production in early summer that almost matched that of the newer mix, but it took more acres to do the job. And they let him down during the last half of summer.

Michigan State was the first agricultural college to recommend brome-alfalfa as a superior pasture mixture. It first proved the combination for poultry lots; found it formed a dense turf that kept chicks off the ground. Farmers needed a grass combination consistently high in yield that would not bloat livestock, so station workers, led by H. C. Rather, head of the farm-crops department, gave brome-alfalfa a trial. When 9 acres carried 10 big beef cows and their calves from May 12 to November 1 during the drouth year, 1936, with no supplemental roughage except a half feed of silage during the driest 30 days, information on carrying capacity and seeding directions were given wide circulation. Extension men and the college news service kept plugging the new pasture, and Michigan with 1½ to 2 million acres, leads the nation. Nebraska began to realize the virtues of brome in 1935, when Jacob Saltzman, Fillmore county, used it to win in the state's first pasture contest. Later contests showed it better with a legume than alone, and the state's extension workers began to talk brome-alfalfa, with the result

Nebraska probably is second in acreage seeded to the mixture.

Hundreds of the best Michigan farmers now sow brome with every acre of alfalfa they seed. They mow the field for hay the first 2 years it is down, then turn it to pasture another year or so. Rather believes 7 to 8 pounds of alfalfa and the same weight of brome an ideal seeding. Some dairymen use the customary alfalfa seeding and add but 3 to 5 pounds of brome an acre. By the beginning of the third year alfalfa begins to thin, whether in a straight seeding or a mixture. Brome sends out its rhizomes to take over any space given up by alfalfa. After producing hay 2 years, a seeding of 5 pounds of brome an acre will be half brome, and safe as pasture in areas where cattle or sheep bloat on straight alfalfa.

Performance of the combination under hot, dry conditions gave the impression in areas of greater rainfall, that it might be suited only to drier sections of the country. It since has proved it holds a margin over other perennial grass mixtures in moist climates, too. Ivan Slater, who seeded 26 acres in Webster county, Iowa, in 1941, pastured 100 hogs on it in 1942 and took off 3 tons of hay an acre in 2 cuttings. Last year he pastured 100 hogs and 130 yearling steers that were getting 8 to 12 pounds of grain apiece daily, and cut 16 tons of hay.

Will Riegel tried out a small acreage in Champaign county, Illinois, on land good for 80 to 100 bushels of corn an acre. He got so much feed from it that he plowed up all the bluegrass pasture on land he operates and reseeded the ground to brome-alfalfa.

Alfalfa had thinned until it made up but 25 per cent of the stand on 42 acres in Gage county, Nebraska, that carried 110 steers and 350 hogs for Frank Allington and Son in 1943. A third of the pasture was fenced away from the steers, but swine had the run of the entire acreage. The Allingtons, with a combine set above alfalfa, cut 4,000 pounds of brome seed from the 14 acres. It sold for 15 cents a pound and made a return of $42.85 an acre. The 110 steers were put in dry lot August 15. October 20, the Allingtons turned 160 replacement steers that averaged 500 pounds on the 42 acres and 20 acres of new-seeding brome-alfalfa. They got 42 days pasture from the 62 acres, with a stocking of more than 2½ steers an acre. The Allingtons refer to brome-alfalfa as "the marvel grass mixture."

Virtues of the Combination

Here are some of the things that make it a pasture combination that can be given space on the most productive farm land in

the Middle West: 1—It combines bromus inermis, the most productive high-protein blade grass, with alfalfa, the top-yielding legume; 2—The alfalfa supplies nitrogen needed by brome to insure highest yields and maximum protein production; 3—The brome, once it comprises half the stand, removes bloat danger which always is present with pure stands of alfalfa; 4—Diseases cause rapid thinning and heavy winter killing in alfalfa after the second year, and brome, which spreads by rhizomes, thickens to occupy all space given up by alfalfa, thus keeping out weeds and giving the mixture maximum value as an erosion control crop; 5—Both the blade grass and the legume continue production thruout the growing season instead of giving up in late summer as do red clover, timothy, bluegrass, sweet clover and other grasses commonly used in pasture mixtures.

There is no magic in brome seeded without a legume. The grass is a high producer, but it manufactures so much protein it soon depletes soil nitrogen if alfalfa is not present to provide new supplies, and yield and protein content both go down. At the Newton experiment field in Illinois, brome hay grown with alfalfa contained 272 pounds of protein a ton; that grown alone had 110 pounds a ton less. In tests by Henry Ahlgren, of the Wisconsin station, brome averaged only 99 pounds more feed annually than timothy, tho feeding value probably surpassed that of timothy by a much wider margin. During the 4 years, 1940 to 1943 inclusive, brome's annual average was 3,914 pounds of dry matter an acre; timothy 3,815; straight alfalfa 5,116; timothy-alfalfa 5,770; brome-alfalfa 7,508. The combination beat a straight seeding of alfalfa by 46.5 per cent and straight brome by 91.8 per cent.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

A Living from Bees — By Frank C. Pellett, Field Editor of American Bee Journal. Orange Judd Publishing Co., Inc. (1943). $2.00.

America's Garden Book — By Louise Bush-Brown and James Bush-Brown. Charles Scribner's Sons (1939). $3.50.

An Agricultural Testament—By Sir Albert Howard, C.I.E., M.A., former Director, Institute of Plant Industry, Indore. Oxford University Press. $3.50.

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean of the School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $2.85.

Beef Cattle — By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Sons, Inc. $4.00.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers (1941). $2.00.

Breeds of Livestock in America—By Henry W. Vaughan, formerly Prof. of Animal Husbandry, Iowa State Coll., Univ. of Minn., Mont. State Univ. College Book Company. $3.75.

Dairy Cattle and Milk Production — By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. The Macmillan Co. $3.90.

Dairy Science — By W. E. Petersen, Ph.D., Assoc. Prof. and Assoc. Dairy Husbandryman, Univ. of Minn. Edited by R. W. Gregory. J. B. Lippincott Company (1939). $4.00.

Diseases and Parasites of Poultry — By Edgar Hugh Barger, D.V.M., Berkeley, Calif., and L. E. Card, Ph.D., Prof. of Poultry Husbandry, Univ. of Illinois. Lea & Febiger. 3rd Edition (1943). $3.75.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.00.

Farm Management and Marketing — By V. B. Hart, M. C. Bond, L. C. Cunningham, all of N. Y. State College of Agriculture, Cornell University. Publishers: John Wiley & Sons, Inc. (1942). $2.75.

Farm Records — By John A. Hopkins, Ph.D., Asso. Prof. of Economics, Iowa State College. Iowa State College Press. $2.50.

Forestry in Farm Management—By R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc. (1941). $3.00.

Growing Tree and Small Fruits—By H. B. Knapp, Director, State Institute of Applied Agriculture, Farmingdale, Long Island, N. Y., and E. C. Auchter, Chief, Bureau of Plant Industry, U. S. D. A. John Wiley & Sons. $2.75.

Grow Your Own Fruit—By M. G. Kains, formerly with U. S. Dept. of Agriculture; Professor of Horticulture, Pennsylvania State College. Charles Scribner's Sons. $3.50.

How to Raise Rabbits for Food and Fur — By Frank G. Ashbrook, Fish and Wildlife Service, U. S. Dept. of the Interior. Orange Judd Publishing Co., Inc. (1943). $2.00.

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.

Livestock Production—By Walter H. Peters, Chief of the Division of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $3.50.

Livestock Judging Handbook — By Julius E. Nordby and W. Malcolm Beeson, Ph.D., Asst. Professors Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.

Modern Agricultural Mathematics — By Maurice Nadler, B.S., A.M. Dept. of Mathematics, Newtown High School, Long Island. Orange Judd Publishing Co., Inc. (1942). $2.00.

Modern Farmers' Cyclopedia of Agriculture—By Earley Vernon Wilcox, Ph.D., Agricultural Writer, formerly with U. S. Dept. of Agriculture. Orange Judd Publishing Co., Inc. (1944). $4.50.

Natural Principles of Land Use—By Edward H. Graham,, Chief of the Biology Division of the Soil Conservation Service. Oxford University Press. 275 pages. $3.50.

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $5.00.

Practical Farming for the South — By Benjamin F. Bullock, now Prof. of Rural Education, Atlanta University, Atlanta, Georgia. Univ. of North Carolina Press. $2.50.

Profitable Poultry Keeping — By H. Clyde Knandel, Prof. and Head, Dept. of Poultry Husb., Penn State College. Orange Judd Publishing Co., Inc. $3.00.

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. The Macmillan Co. $3.75.

Repairing Farm Machinery—By Ivan G. Morrison, Asst. Professor Agri. Education, Purdue University. The Interstate Printers & Publishers. $1.80.

Roots in the Earth—The Small Farmer Looks Ahead — By P. Alston Waring and Walter Magnes Teller. Harper & Bros. $2.50.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.00.

Soil Conservation — By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.

Some Common Diseases of Cattle—By George R. Conn, B.S.A.H., D.V.M. Orange Judd Publishing Co., Inc. (1942). $1.50.

Successful Poultry Management — By Morley A. Jull, Professor and Head of Poultry Dept., University of Maryland. McGraw-Hill Book Company. $3.00.

The American Land—Its History and Its Uses — By William R. Van Dersal, biologist in the United States Department of Agriculture. Oxford University Press. $3.75.

The Farm Primer—By Walter Magnes Teller, formerly with the Farm Security Administration, U. S. D. A. David McKay Co. $2.50.

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